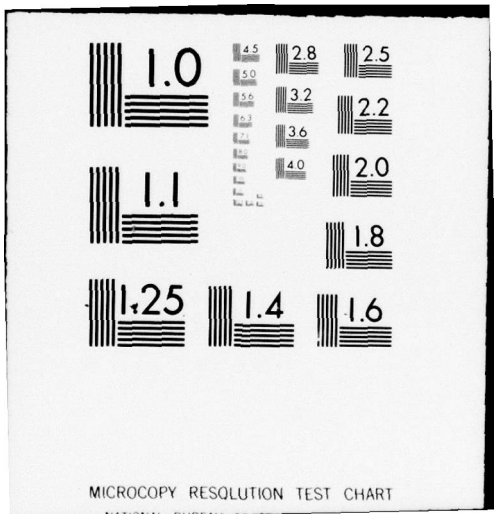
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A detailed analysis of the environmental impacts associated with the construction and operation of a coal-fired steam electric generating station. The proposed plant will occupy a 963 acre site on the south shore of Lake Ontario in the Town of Somerset, Niagara County, New York. Steam produced by this facility will be used to generate approximately 850 megawatts of electrical power. The water intake and effluent discharge system will be located in Lake Ontario. Approximately 1.9 to 2.2 million tons of coal will be consumed annually.

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SUMMARY

CAYUGA STATION
SOMERSET, NEW YORK

( ) DRAFT (X) FINAL ENVIRONMENTAL IMPACT STATEMENT

RESPONSIBLE OFFICE: U.S. Army Engineer District, Buffalo, 1776 Niagara Street, Buffalo, NY 14207 Telephone No. (716) 876-5454.

1. NAME OF ACTION: (X) Administrative ( ) Legislative

2. DESCRIPTION OF ACTION: This Final Environmental Impact Statement was prepared by the U.S. Army Corps of Engineers, Buffalo District, as the lead Federal agency to fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA). The proposed action is the construction and operation of a fossil fuel steam electric generating station at Somerset, New York, by the New York State Electric and Gas Corporation. (NYSEG) The applicant anticipates that the plant will be in commercial operation by October 1983. The proposed generating station will utilize one coal-fired unit to produce steam for the generation of 850 megawatts of electrical power. The exhaust steam from the turbine generator will be cooled and condensed by using Lake Ontario water pumped to the plant via pipeline and circulated through a once-through circulating water system. Exhaust gases from coal combustion will be vented to the atmosphere via a 450-foot stack after passing through control devices capable of reducing the amount of air pollutants emitted. These control devices will include electrostatic precipitators and/or throwaway limestone Flue Gas Desulfurization (FGD) system. The electrical power produced under this proposal will be transmitted via high voltage electrical transmission lines to connections with existing and independently proposed transmission circuits in the New York State Electric and Gas Corporation network. All coal will be delivered to the site by rail. The specific route will depend on the selected coal source as well as environmental and socioeconomic considerations. The facility will require approximately 1.9 to 2.2 million tons of coal per year.

3. (A) ENVIRONMENTAL IMPACTS: The proposed generating station would:

(1) Provide 850 megawatts (MW) of electrical power to the New York State Electric and Gas Corporation's system to meet the projected power demands of its customers.

(2) Provide a reasonable reserve margin of electrical generating capacity to the NYSEG Corporation system, thereby improving system

reliability for the company and the interconnected New York Power Pool and Northeast Power Coordinating Council.

(3) Provide approximately 1.86×10^{11} kwh of electricity over the projected 30-year life of the plant.

(4) Increase the assessable property in Somerset, Niagara County, New York and thereby increase local, County, State, and Federal tax revenues.

(5) Create about 112 permanent jobs (30-year duration) and about 1,310 temporary construction jobs during the peak year of construction.

(6) Produce about 4.3 million dollars per year in permanent job wages (by 1985) and about 150 million dollars over the entire construction period.

(B) ADVERSE ENVIRONMENTAL EFFECTS: The proposed generating station construction and operation would have the following adverse environmental effects:

(1) The construction of the plant would result in the conversion of 50 acres of land to be permanently committed to industrial use. This area includes 21 acres of active agricultural land, while the remaining 24 acres are comprised of open field (11), lakeshore vegetation (2), woodland (5), deserted orchard (2), and fence row (4). Total land within the Somerset site will be 963 acres.

(2) The mining of large quantities of coal needed by the plant will increase regional environmental and socioeconomic impacts in the coal mining areas.

(3) The increased road and rail traffic due to transportation of construction workers and materials will have impacts on normal traffic patterns in the plant area.

(4) Construction of the offshore discharge and intake-discharge system will temporarily degrade water quality and displace benthic fauna.

(5) The construction and operation of the plant will result in the discharge to Lake Ontario of some chemical wastes and silt. This discharge is not expected to have significant impacts on aquatic life. None of these discharges are expected to be in excess of applicable water quality standards.

(6) Small quantities of construction materials such as steel, concrete, nonrecyclable minerals and metals will be irretrievably committed in the station's construction.

(7) Heated water will be discharged from the plant to Lake Ontario via a submerged staged diffuser. No significant effect on aquatic biota is anticipated. No thermal discharge exceeding that permitted by applicable water quality regulations is expected.

(8) Large quantities of aquatic organisms entrained in the circulating water system will be killed due to thermal, chemical, and mechanical stress. The entrainment and loss of planktonic organisms is expected to have only localized effects on the aquatic ecosystem. No significant effects on total populations or species diversity in the area are anticipated. The entrainment of fish larvae will not constitute a significant impact on the lake fishery.

(9) Although there is a potential for impingement of fish at the proposed power plant, the installation of appropriate screening will reduce the losses.

(10) The once-through cooling water system will discharge 235,000 gpm of thermal effluent at a design temperature rise of 35°F above ambient. Maximum induced surface temperature rise will be 4.2°F within the initial jet mixing zone. A 3° isotherm will encompass a maximum area of 18 acres.

(11) The annual combustion of about 1.9 to 2.2 million tons of coal will produce increased regional levels of air pollution. However, no releases of air pollutants in excess of present air emission standards are postulated. Plant emissions are not expected to increase the frequency of any violations of short-term standards and will not cause significant increases in the long-term air quality levels present as background in the area.

(12) Coal ash/stabilized FGD sludge and pyritic refuse will be disposed by landfilling in the eastern portion of the plant site. This solid waste landfill will ultimately occupy an area of 228 acres over 30 years. Fugitive dust generation from the disposal operation is not anticipated to be a problem.

(13) The presence of the power plant, transmission lines, and workmen will constitute an aesthetic intrusion into the present rural setting of the area. Landscaping, screening, and noise reduction methods will reduce but not eliminate adverse aesthetic impacts.

4. ALTERNATIVES TO THE PROPOSED ACTION:

(A) Alternatives Not Requiring the Creation of New Base Load Capacity
(B) Alternative Power Sources
(C) Alternative Sites
(D) Alternative Plant Designs
(E) Fish Return Systems or Alternative Screening Methods
(F) Waste Heat Utilization
(G) Atmospheric Emission Control Systems

5. COMMENTS:

A. To insure full coordination, the DEIS was sent to Federal, State, and local government agencies, private industries, citizens and environmental groups, and individuals for review and comment. A coordination list is presented below:

- U.S. Environmental Protection Agency
- U.S. Department of Agriculture
- U.S. Department of Interior
- U.S. Department of Housing and Urban Development
- U.S. Department of Commerce
- U.S. Public Health Service
- Food and Drug Administration
- Water Resources Council
- Nuclear Regulatory Commission
- Federal Aviation Administration
- Federal Railroad Administration
- Great Lakes Basin Commission
- Appalachian Regional Commission
- U.S. Coast Guard
- General Services Administration
- U.S. Department of Health, Education, and Welfare
- Interstate Commerce Commission
- National Endowment for the Arts
- St. Lawrence Seaway Development Corporation
- Federal Highway Administration
- U.S. Fish and Wildlife Service
- Advisory Council for Historic Preservation
- U.S. Department of Energy

New York State:

- Public Service Commission
- Department of Environmental Conservation
- Office of General Services
- Office of State Archeologist

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- Department of Health
- Division of Budget
- Office of Parks and Recreation
- Sea Grant Program Office
- Department of Commerce
- Division of State
- Department of Transportation
- NY Job Development Authority
- Department of Agriculture and Markets
- State Energy Office

County:

- Niagara County Board of Supervisors
- Erie and Niagara Counties Regional Planning Board
- Niagara County Economic and Development Planning Department

Local:

- Newfane Town Planning Board
- Barker Village Planning Board
- Somerset Town Planning Board

Industries, Citizen and Environmental Groups and Individuals:

- New York Power Pool Control Center
- Natural Resources Defense Council
- Sierra Club, New York Office
- NY Great Lakes Grape Industry Program
- League of Women Voters
- ORBA Corporation

B. The following Federal, State, and local governmental agencies have provided responses to the Draft Environmental Impact Statement:

- U.S. Environmental Protection Agency
- U.S. Department of Agriculture
- U.S. Department of Interior
- U.S. Department of Housing and Urban Development
- U.S. Department of Commerce
- U.S. Coast Guard
- General Services Administration
- St. Lawrence Seaway Development Corporation
- U.S. Fish and Wildlife Service
- Advisory Council for Historic Preservation
- Department of Energy

- New York State:
  - Public Service Commission
  - Office of General Services
  - Department of Environmental Conservation
  - Office of State Archeologists
  - Department of Transportation

County:

Erie and Niagara Counties Regional Planning Board
Niagara County Economic and Development Planning Department
Niagara County Department of Public Works

(X) Draft EIS filed with U.S. EPA 15 May 1978

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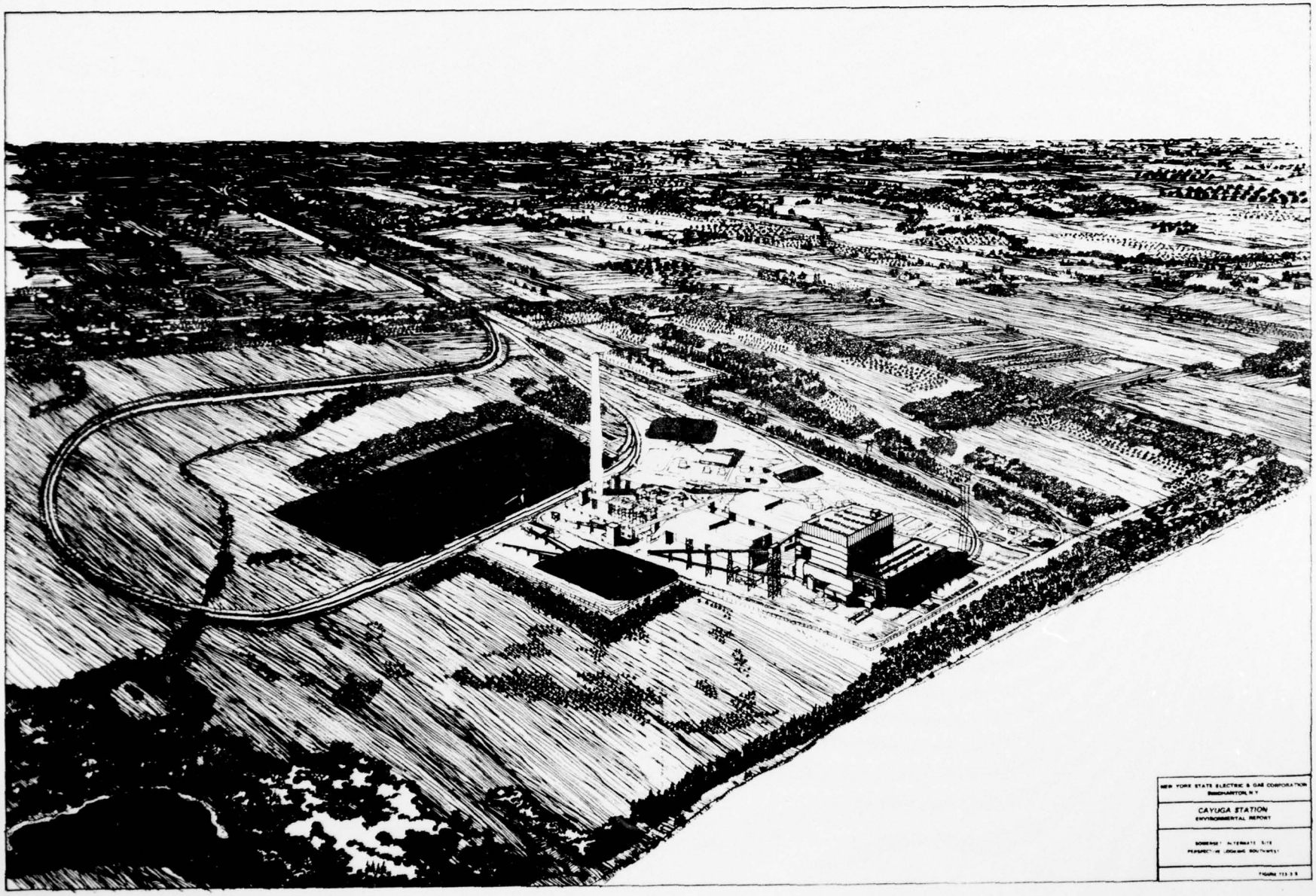
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NEW YORK STATE ELECTRIC & GAS CORPORATION
BINGHAMTON, N.Y.
CAYUGA STATION
ENVIRONMENTAL REPORT

NEW YORK STATE ELECTRIC & GAS CORPORATION
BINGHAMTON, N.Y.
CAYUGA STATION
ENVIRONMENTAL REPORT

FOREWORD

On 16 July 1976, the New York State Electric and Gas Corporation (NYSEG) filed an application for a Department of the Army permit to perform certain work in the vicinity of Somerset, New York, that is subject to regulation under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act of 1972. Specifically, authorization is requested to construct a cooling water intake and discharge system in Lake Ontario to perform the dredging needed to facilitate construction of these structures. The New York State Electric and Gas Corporation noted in its application that the work proposed is ancillary to the establishment of a new source 850 megawatt coal-fired steam electric generating station which is planned for the 963-acre tract of land in Somerset, New York. The applicant's proposal to place riprap shore protection has been withdrawn, and the flue gas desulfurization system, listed as an alternative in the DEIS is now part of the conceptual design of the facility.

The purpose of the intake and discharge structures is to provide a reliable source of cooling water and mode of wastewater discharge which is vital to the generation of electric power. Dredging is needed to prepare the base for the intake and discharge structures and their respective pipelines, and to allow the pipelines to be buried beneath the lake bottom. When considered independently, both the intake and discharge construction and the dredging have a relatively minor impact on the environment. However, the development of a new power generating station, as a consequence of the installation of these structures, will have a significant and measurable impact on the human and natural environment, both locally and regionally.

In view of these facts, and in compliance with the requirements set forth in the National Environmental Policy Act of 1969, a determination was made that the analysis of environmental impact must apply to the entire steam electric generating station and not just the work specifically regulated by the Department of the Army permit. Further, the determination found that the proposed activity would significantly affect the quality of the human environment and a decision was made that an Environmental Impact Statement (EIS) was essential for evaluation of these permit applications.

The U.S. Environmental Protection Agency (EPA) has delegated the authority to issue permits under the National Pollutant Discharge Elimination System Program (NPDES) to the State of New York. The EPA still retained its right to review such actions but no longer asserted regulatory control over such discharges as long as the State

program remained consistent with established NPDES guidelines. As a result of this action, the Corps of Engineers remained as the only Federal agency exercising regulatory authority over the proposed project. Further analysis of the Federal regulatory requirements indicated that U.S. Coast Guard permits and EPA air quality permits were required but that these actions would not be initiated until well after the Corps of Engineers had completed action on their own permit application. Therefore, the Corps assumed the role of lead Federal agency during the processing of the Department of the Army permit application and the development of the Environmental Impact Statement. On 13 April 1977, the Corps of Engineers, Buffalo District, announced in their public notice No. 76-484-29, that they would take this lead agency responsibility.

To insure that the concerns of the regulatory agencies were fully identified and the many disciplines required to adequately assess the environmental impact of this facility were represented, an interagency technical review was established. The applicant's environmental report was evaluated and scrutinized by the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Department of the Interior, U.S. Geological Survey, and the New York State Public Service Commission in association with the New York State Department of Environmental Conservation. Cultural resource reports were sent for review to the National Park Service and the New York State Office of Parks and Recreation. During this review period, agencies have identified standards which must be met by the facility to insure that the most environmentally acceptable design is achieved, and have evaluated the data collection effort by the applicant to insure that there is sufficient information to analyze the overall impact of the proposed facility on the environment. The overall net effect of the review is to assist the Corps in the development of a complete and comprehensive Environmental Impact Statement.

This Environmental Impact Statement identifies the primary and secondary impacts associated with the authorization of the Federal permits necessary to construct the proposed Cayuga Station at Somerset, NY. Power plant siting in the State of New York is accomplished under Article VIII of the New York State Public Service Law. This proceeding requires that at least two viable power plant sites be identified and evaluated on a concurrent basis prior to approval of a single site by the New York State Board on Electric Generation Siting and the Environment. The applicant's other site is located on Cayuga Lake in the town of Lansing, New York. The Cayuga Lake site is discussed in this Environmental Impact Statement as an alternative site. The applicant, along with the New York State Public Service Commission (PSC) and the New York State Department of Environmental

Conservation (DEC) intends to recommend the Somerset site to the Board on Electric Generation Siting and the Environment. In deference to the applicant, the PSC, and the DEC, this Environmental Impact Statement addresses Somerset as the primary site. The Corps of Engineers is not involved in the power plant siting process.

This Environmental Impact Statement has been prepared by the Environmental Analysis Section, Regulatory Functions Branch, U.S. Army Engineer District, Buffalo, in accordance with the requirements of the National Environmental Policy Act of 1969, Department of the Army Regulation ER 1105-2-507 (15 April 1974) and 33 CFR 320-329 (19 July 1977), and the guidelines developed by the Council on Environmental Quality (1 August 1973).

The Environmental Impact Statement is prepared first as a draft. This document is circulated through the various Federal, State, and local agencies as well as the general public for review and comment. A final EIS is then prepared in which comments are addressed and resultant project modifications identified. The completed final EIS is then filed with the U.S. Environmental Protection Agency, Washington, DC, at which time it is again distributed to the public for review for 30 days.

The Environmental Impact Statement is not in itself a decision-making document. It will be used to assist the District Engineer in the public interest review prior to determining whether or not the Department of the Army permit, as requested, can be granted.

To insure availability during the designated review periods, copies of the EIS have been placed in the reference sections of the public libraries within the primary and secondary impact areas. Single copies of this statement may be obtained by writing the District Engineer, U.S. Army Engineer District, Buffalo, 1776 Niagara Street, Buffalo, New York 14207, or by calling A/C 716, 876-5454.

CHAPTER 1 - PROJECT DESCRIPTION

INTRODUCTION

1.001
This Environmental Impact Statement (EIS) has been prepared by the U.S. Army Engineer District, Buffalo, and considers the construction, operation, and maintenance of the proposed 850 megawatt (MW) Cayuga Station by the New York State Electric & Gas Corporation (applicant) at the Somerset site in the town of Somerset, Niagara County, New York. The EIS will provide the environmental data base necessary to issue, condition or deny required Federal permits in a judicious manner.

THE APPLICANT

1.002
New York State Electric & Gas Corporation (NYSE&G) is an operating public utility organized under the laws of the State of New York. The corporate headquarters of NYSE&G are located at 4500 Vestal Parkway East, Binghamton, New York 13902.

1.003
On 21 July 1966, the applicant, Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., Long Island Lighting Company, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., and Rochester Gas and Electric Corporation made an agreement called the New York Power Pool (NYPP) Agreement. The NYPP primary objectives include coordinating the planning and operation of generation and transmission systems to achieve a balance of reliability and economy of service. The members of the New York Power Pool also jointly participate in the Northeast Power Coordinating Council which includes Ontario, New Brunswick, and New England.

THE APPLICANT'S PRODUCT, CUSTOMERS, AND SERVICE AREA

1.004
The principal business of the applicant is the generation, purchase, sale, transmission, and distribution of gas and electricity.

In 1975 the applicant provided services for 620,400 customers consisting of 556,000 residential customers, 54,400 commercial customers, 1,200 industrial customers, 7,400 public authority customers, and 800 miscellaneous customers.

1.005
The applicant's service area is about 17,000 square miles (44,030

square kilometers) or about 35 percent of the State's land area, with a population of approximately 1,800,000. NYSE&G's service area is interspersed throughout New York State with the majority of service provided to the south-central portion of the State, covering an irregularly defined area south of Rochester to a point south of Coopers Corners, New York. On the eastern border of New York State, five isolated service areas occur with the largest of these situated in the northeast corner of the State. Two relatively small service areas are located in western New York. The larger cities in which the applicant serves both electricity and gas are Elmira, Auburn, Geneva, Ithaca, and Lockport, while those in which it serves electricity only are Binghamton and Corning. Figure 1-1 is a map of New York State showing the applicant's service area in relation to other New York State utilities.

THE APPLICANT'S GENERATING AND TRANSMISSION FACILITIES

1.006
The applicant has a total installed generating capacity of 1755 MW (Table 1-1), consisting of five coal-fired generating stations in central New York with an installed aggregate capacity of 777 MW and a 50 percent share of a 1200 MW coal-fired, mine-mouth plant at Homer City, Pennsylvania, jointly owned with the Pennsylvania Electric Company. Other sources include 40 MW of hydroelectric and 13 MW of diesel electric generating capacity.

In November 1982, the applicant will gain another 194 MW from Nine Mile Point #2 Nuclear Unit, bringing the total installed capacity to 1949 MW.

The applicant's installed electric capacity is supplemented by purchase allotments from various producing companies within the NYPP and other neighboring systems. This includes from 495 MW in 1963/64 to 1113 MW in 1976/77. The applicant's projections indicate that available purchase allotments will decrease to 766 MW by 1985/86.

1.007
Figure 1-1 illustrates the applicant's franchise area and associated 230kV and 345kV transmission network in relation to the New York Power Pool's interconnected transmission system. NYSE&G's bulk power transmission system consists of a 230kV transmission network which interconnects with Niagara Mohawk Power Corporation (NMPC) at the Gardenville 230kV substation, located in western New York; with the Power Authority of the State of New York (PASNY) at the Lewiston 230kV substation, located near Niagara Falls; and with General Public Utilities Corporation at the Towanda 230kV substation, located in northern Pennsylvania. NYSE&G's 345kV transmission network connects NYSE&G's jointly owned (50 percent) Homer City generating facility,

TABLE 1-1

NEW YORK STATE ELECTRIC & GAS CORPORATION
GENERATING STATION CAPABILITY

Existing Units (MW) Station	Unit No.	Installation Date	Type[a]	Fuel	Net 4-Hour Capability Rating (MW) Summer	Winter
Goudey	7	Jan. 1944	T	Coal	44	44
Goudey	8	Dec. 1951	T	Coal	82	82
Greenidge	1	May 1938	T	Coal	24	24
Greenidge	2	Sep. 1942	T	Coal	23	23
Greenidge	3	June 1950	T	Coal	55	55
Greenidge	4	Dec. 1953	T	Coal	103	103
Hickling	1	Dec. 1948	T	Coal	33	33
Hickling	2	July 1952	T	Coal	50	50
Jennison	1	Nov. 1945	T	Coal	35	35
Jennison	2	Aug. 1950	T	Coal	38	38
Milliken	1	Oct. 1955	T	Coal	143	143
Milliken	2	Oct. 1958	T	Coal	147	147
Homer City[b]	1	July 1969	T	Coal	300	300
Homer City[b]	2	Dec. 1969	T	Coal	300	300
Homer City	3	Fall 1977	T	Coal	325	325
Misc. Hydro	9 Units	---	H	--	40	40
Misc. Diesels	5 Units	---	D	Oil	13	13
			Total Installed Capability		1755	1755

a. T = Thermal

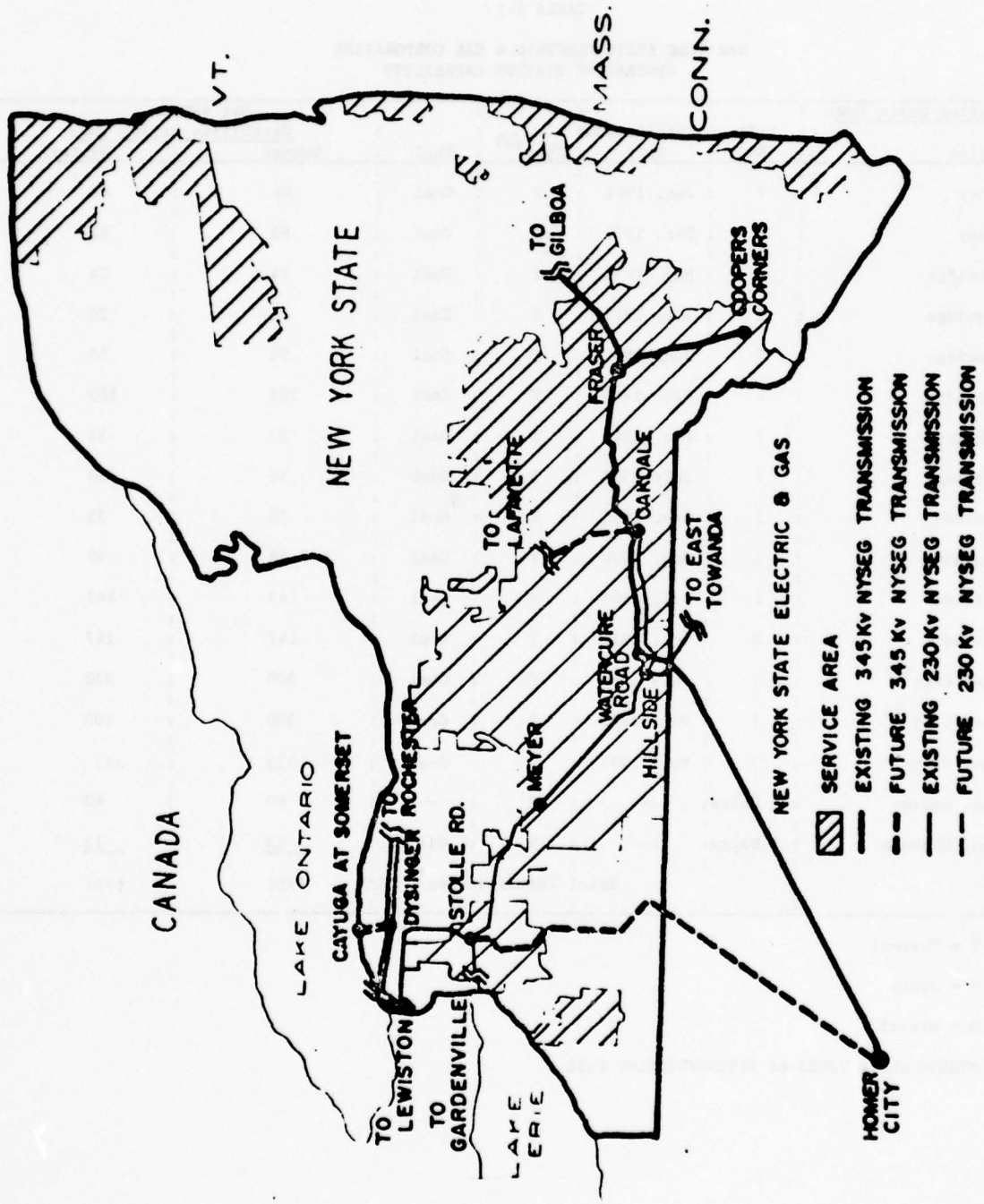
H = Hydro

D = Diesel

b. NYSE&G share (50%) of NYSE&G/PENELEC Unit

FIGURE 1-1

NEW YORK STATE ELECTRIC & GAS CORPORATION
SERVICE AREA



located in Pennsylvania, with the Watercure Road 345kV substation, located east of the city of Elmira, and interconnects with PASNY at the Gilboa 345kV substation located in eastern New York State.

DEMAND FOR ELECTRICITY

1.008
The demand for electricity in the applicant's service area can be discussed in terms of two major demands, power demand in megawatts (MW) and energy demand in millions of kilowatt hours (GWhr). The New York State Electric & Gas Corporation system experiences peak demand for electricity during winter while peak demand for the New York Power Pool occurs in the summer. Both of these situations are expected to continue through at least the year 1990.

The annual energy requirements in the applicant's service area increased from 4836 GWhr in 1963 to 11051 GWhr in 1976. Similarly, peak day load requirements or peak power demand increased from 908 MW to 2054 MW during this period of time. The total system capability of 1333 MW in 1963 was sufficient to meet the power demand and provide a reserve of 46.8 percent. Total system capability was 2543 MW in 1976 with an actual reserve of 23.8 percent.

1.009
The applicant's projections of peak day load requirements indicate that power demand will rise to 2403 MW in 1979/80, 3373 MW in 1985/86 and 4083 MW in 1989/90. The corresponding projections of total capability without the proposed station in service are 2572 MW in 1979/80, 2717 MW in 1985/86, and 2717 MW in 1989/90. By comparing the projected power demand (peak load) to NYSE&G total capacity (installed power plus purchased power) without the proposed Cayuga Station (850 MW) a power deficiency will occur during December 1980 and increase in magnitude each successive year.

Tables 1-2 and 1-3 show the applicant's capability, peak load, reserve margins, annual energy requirements, and annual load factor histories and projections from 1963 through 1990 for NYSE&G with and without the proposed 850 MW facility. These tables include the applicant's share of Nine Mile Point Nuclear Unit #2 and a proposed seasonal exchange of 100 MW of Nine Mile Point Unit #2 capacity between the Long Island Company and the applicant. Should commercial operation of Nine Mile Point Unit #2 be delayed beyond fall of 1982, the applicant expects even greater deficiencies than those shown in Table 1-2.

RESERVE REQUIREMENTS

1.010
The members of the NYPP have determined that a minimum generating

TABLE 1-2

NEW YORK STATE ELECTRIC AND GAS CORPORATION
WINTER CAPACITY PEAK LOADS AND MARGINS WITHOUT THE PROPOSED FACILITY

	Installed Net Capability (MW)	Purchased & (Sales) (MW)	Total Capability (MW)	Peak Load (MW)[c]	Reserve			Annual Energy Requirements (GWhr)	Load Factor Based on Annual[b] Peak Load
					Actual (MW)	Actual (%)	Contractual[a] Agreement		
*1963/64	848	495 (10)	1333	908	425	46.8	109	4836	60.8
1965/66	849	495 (60)	1284	1047	237	22.6	126	5619	61.3
1967/68	855	532 (0)	1387	1209	178	14.7	145	6503	61.4
1969/70	1369	532 (186)	1715	1392	323	23.2	167	7609	62.4
1971/72	1407	526	1933	1541	392	25.4	185	8612	63.8
1973/74	1420	714 (50)	2084	1686	398	23.6	202	9866	66.8
1975/76	1428	894	2322	1977	345	17.4	356	10268	59.3
1977/78	1755	968	2723	2143	580	27.1	386	11520	61.4
1979/80	1755	817	2572	2403	169	7.0	433	12520	59.5
1981/82	1755	701	2456	2723	-267	-9.8	490	13820	57.9
1983/84	1951	781	2732	3043	-311	-10.2	548	15220	57.1
1985/86	1951	766	2717	3373	-656	-19.5	607	16720	56.6
1987/88	1951	766	2717	3733	-1016	-27.3	672	18320	56.0
1989/90	1951	766	2717	4083	-1366	-33.5	735	20120	56.2
1991/92	1951	766	2717	4433	-1716	-38.8	798	21820	56.2

* Each entry in this column represents one winter period which includes a span from November through February. Thus, the line 1963/64 represents November 1963 to February 1964: line 1965/66 is November 1965 to February 1966, etc.

a. Contractural Agreement MW is 12% of the peak load prior to 1975; 18% of peak load 1975 and beyond.

b. Where annual peak load occurs during early part of next year, it is applied against energy requirements of previous year for load factor calculations.

c. Peak load periods have historically occurred almost exclusively in December and are anticipated to continue to peak in December.

TABLE 1-3

NEW YORK STATE ELECTRIC AND GAS CORPORATION
WINTER CAPACITY PEAK LOADS AND MARGINS WITH THE PROPOSED FACILITY

	Installed Net Capability (MW)	Purchased & (Sales) (MW)	Total Capability (MW)	Peak Load[c] (MW)	Reserve			Annual Energy Requirements (GWhr)	Load Factor Based on Annual[b] Peak Load
					Actual (MW)	Actual (%)	Contractual Agreement[a]		
*1963/64	848	495 (10)	1333	908	425	46.8	109	4836	60.8
1965/66	849	495 (60)	1284	1047	237	22.6	126	5619	61.3
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1973/74	1420	714 (50)	2084	1686	398	23.6	202	9866	66.8
1975/76	1428	894	2322	1977	345	17.4	356	10268	59.3
1977/78	1755	968	2723	2143	580	27.1	386	11520	61.4
1979/80	1755	817	2572	2403	169	7.0	433	12520	59.5
1981/82	1755	701	2456	2723	-267	-9.8	490	13820	57.9
1983/84	2801	781	3582	3043	539	17.7	548	15220	57.1
1985/86	2801	766	3567	3373	194	5.8	607	16720	56.6
1987/88	2801	766	3567	3733	-166	4.4	672	18320	56.0
1989/90	2801	766	3567	4083	-516	-12.6	735	20120	56.2
1991/92	2801	766	3567	4433	-866	-19.5	798	21820	56.2

* Each entry in this column represents one winter period which includes a time frame from November through February.

a. Contractual Agreement MW is 12% of the peak load prior to 1975; 18% of peak load 1975 and beyond.

b. Where annual peak load occurs during early part of next year, it is applied against energy requirements of previous year for load factor calculations.

c. Peak load periods have historically occurred almost exclusively in December and are anticipated to continue to peak in December.

capacity reserve margin of 22 percent for New York State, as a whole, is required to meet the one-day-in-ten-year loss of load probability criterion. Three member companies have winter peak loads and four member companies have summer peak loads resulting in an annual diversity of at least four percent. This diversity is sufficiently large so that an 18 percent reserve margin, based on individual company peak loads, results in a Statewide reserve margin over the New York State Interconnected Systems coincident peak load at least equal to the 22 percent reserve margin required by the reliability criterion. Thus, the applicant is required to maintain not only sufficient generating capacity to meet its corporate load requirements but to maintain an 18 percent generating capacity reserve margin above its annual corporate peak load, not to exceed 27 percent of its off peak, summer capability period, peak load. The Federal Power Commission (FPC) commenting on a recent proposal to construct a nuclear facility (Sterling Nuclear Unit One) within the New York Power Pool system indicated that many power systems plan for reserves between 15 and 25 percent of annual peak loads. This agency recommended that, based on the FPC 1970 National Power Survey, electric utility planning should overall be based on maintaining an average nationwide reserve margin of approximately 20 percent.

The New York Power Pool formulated a generation expansion plan to insure a 22 percent minimum reserve based on each but not both of the following conditions:

- Accelerated load growth in New York State but with all planned generation in-service as scheduled.

- Planned generation in-service dates delayed but with load growth as forecast.

APPLICANT'S RESERVE STATUS

1.011
The tabulations below illustrate the applicant's projected deficiencies in terms of actual reserve and their actual reserve minus power obligations to the New York Power Pool (NYPP). As shown below, NYSE&G predicts their system reserve will fall below 18 percent during the winter period of 1977/78 with actual reserves deficient by the winter period of 1980/81. Since the Cayuga Station would not be operational until 1983, shortages prior to that date may be unavoidable. With the facility operational by the winter period of 1983/84, actual reserves would be restored to 17.7 percent of peak load (539 MW). Actual reserve deficiencies would subsequently be averted until December of 1987, when demand would again exceed the applicant's total capability. Therefore, the applicant, under this proposal,

will consistently fall short of its contractual agreement of maintaining an 18 percent capacity reserve margin above its peak load.

The applicant's forecasts of surplus/deficiency without the proposed Cayuga Station from the winter periods of 1977/78 to 1987/88 are summarized as follows:

Load Period (Winter)			*NYSE&G Reserve Capacity (MW)	
	Percent	Actual Reserve or (Deficiency) (MW)	Contractual Agreement (MW)	Difference Between Reserve and Contractual Agreement (MW)**
1977-78	27.1	580	386	194
1978-79	13.6	309	407	-98
1979-80	7.0	169	433	-264
1980-81	-3.9	(101)	461	-562
1981-82	-9.8	(267)	490	-757
1982-83	-5.2	(151)	521	-672
1983-84	-10.2	(311)	548	-859
1984-85	-15.1	(482)	576	-1058
1985-86	-19.5	(656)	607	-1263
1986-87	-23.6	(836)	640	-1476
1987-88	-27.3	(1016)	672	-1688

* These figures include 194 MW from Nine Mile Point #2 and a proposed seasonal exchange of 100 MW from Nine Mile Point #2.

** The reserves in this column reflect the applicant's capacity minus the 18 percent obligated to the New York Power Pool.

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1977-78	27.1	580	386	194
1978-79	13.6	309	407	-98
1979-80	7.0	169	433	-264
1980-81	-3.9	(101)	461	-562
1981-82	-9.8	(267)	490	-757
1982-83	-5.2	(151)	521	-672
1983-84	17.7	539	548	-9
1984-85	11.5	368	576	-208
1985-86	5.8	194	607	-413
1986-87	0.4	14	640	-626
1987-88	-4.4	(166)	672	-838

* These figures include 194 MW from Nine Mile Point #2 and a proposed seasonal exchange of 100 MW from Nine Mile Point #2.

** The reserves in this column reflect the applicant's capacity without the 18 percent obligated to the New York Power Pool.

ENERGY FORECASTS

Residential Sales

1.012
A study of the applicant's future energy requirements (sales) was performed by the New York State Public Service Commission. Analysis

of residential, commercial, and industrial sales forecasts indicate that by 1985 total energy requirements will range from 16900 to 17000 GWhr. The applicant's 1985 projections are slightly less, ranging from 15920 GWhr in the winter of 1984/85 to 16720 GWhr in the 1985/86 winter. Essentially however, the Public Service Commission's projections paralled the sales forecasts of the applicant with only minor exceptions. Variations between analyses are related to differences in methodology employed to develop forecast loads.

1.013
For the residential sector, the Public Service Commission (PSC) has estimated the growth in energy requirements using the general methodology which National Economic Research Associates (NERA) has used for each of the New York State companies. Fundamentally, this model categorized appliance usage into competitive fuel types (i.e., space heating, water heating, cooking, and clothes drying) and those for which alternative fuel types are not available, "net use," (i.e., lighting, refrigeration).

The "net use" forecasts concentrate on two variables, the price of electricity and income. Thus, the forecasts are based on the estimates of the impacts of these variables on net use and on projections of the changes expected in these variables. For projections of changes in these independent variables, PSC has assumed increases in the real price of electricity of 3.5 percent annually and increases in real income of 2.3 percent annually to 1985. The result of these assumptions and the estimated elasticities is growth in net usage per residential customer of approximately 1.0 percent per year from 1975 to 1985.

1.014
Growth in appliance-related usage is associated with increasing saturation of appliances for which a competitive fuel exists, namely space heating, water heating, clothes drying, and cooking. Projections on this component are based on PSC forecasts of saturations of these competitive fuel appliances in 1985. Specifically, 1985 saturation levels are projected as follows:

Space Heating - 16.5 percent

Water Heating - 35 percent

Cooking - 55 percent

Clothes Drying - 55 percent

1.015
Projected residential customer growth rates were also assimilated in the model. PSC has assumed a growth rate of slightly over 2.0 percent per year for the NYSE&G territory, resulting in approximately 675,000 customers in 1985. This is based on the 1976 household projections of the Economic Development Board.

Thus, by combining the 1976 Economic Development Board projected increase in the number of households with the weighted (.6) net usage of 1.0 percent increase and the weighted (.4) appliance-related usage of 6.5 percent increase, a projected annual increase in total residential sales is approximated at 5.3 percent.

In addition to above methodology, a companion study was conducted, by multiplying probable saturations of electric appliances for the year 1985 times the annual kWh usage for these appliances. See Table 1-4.

1.016
The applicant's residential model categorized appliance usage into temperature sensitive load (i.e., space heating and air conditioning) and baseload (all other appliances). Forecasts of temperature sensitive appliances were based on projected saturation levels within single dwelling units (single family homes, mobile homes, apartments) for electric heat and air conditioning. Saturation rates for space heated dwelling units are expected to rise from 0.1 percent in 1960 to 33 percent in 1995, while air conditioning rates will rise from 3.3 percent in 1960 to 68 percent in 1995. Assumptions from which these forecasts were derived include increased housing, availability, and dependability of electric power, anticipated conversion of older home heating systems to electric heat and a small portion has been attributed to the increasing popularity of the heat pump. Growth rates of temperature sensitive appliances are shown in Table 1-6.

Baseload forecasts were established by multiplying the average projected annual use per customer by the number of anticipated customers. This portion of use is not accounted for by the large appliances (e.g., refrigerator) was assumed to continue to grow at the historical rate of five percent per year (Tables 1-5 and 1-6).

Commercial Sales

1.017
Commercial electricity sales forecasts analyses are difficult, primarily because consistent data about customers is not available. The applicant has related the commercial component to the Gross National

TABLE 1-4

PROJECTED ELECTRIC ENERGY CONSUMPTION PATTERN
FOR AVERAGE HOUSEHOLD
NYSE&G - 1985*

Appliances	Electricity Consumption (KWh year)	Saturation (percent)	Average Household Consumption (KWh year)
Space Heating	13500	16.5	2227.5
Water Heating	3850	35	1347.5
Cooking	1150	55	632.5
Clothes Drying	950	55	522.5
Refrigerator	1300	100	1300
Freezer	1300	50	650
Dishwasher	325	60	195
Washing Machine	80	85	68
Air Conditioning (Room)	300	40	120
Air Conditioning (Central)	1500	6	90
Television	400	100	400
Lighting, Small Appliances	2250	100	2250
Total Consumption Per Household			9803

* Obtained from the NYS Public Service Commission direct case (Article VIII proceedings - Proposed Cayuga Station).

TABLE 1-5
DEMOGRAPHIC ASSUMPTIONS

Year	Service Area Population (a)	Service Area Households (a)	Total Residential Customers	Gross National Product (b) (Billions 1976 ($))	Annual GNP Growth Over Previous Yr. (Percent)
1975	1,651,577	507,809	557,000 (Actual)	1,582.1	--
1976			565,000 (Est.)	1,686.6	6.6
1977			574,000	1,748.8	3.7
1978			584,000	1,856.4	6.2
1979			596,000	1,902.5	2.5
1980	1,718,810	559,516	608,000	1,998.0	5.0
1981			621,000	2,088.0	4.5
1982			633,000	2,161.0	3.5
1983			646,000	2,204.0	2.0
1984			659,000	2,281.0	3.5
1985	1,801,514	614,363	673,000	2,355.0	3.2
1986			684,000	2,430.0	3.2
1987			695,000	2,508.0	3.2
1988			706,000	2,588.0	3.2
1989			717,000	2,671.0	..2
1990	1,887,285	664,502	728,000	2,758.0	3.3
1991			737,000	2,841.0	3.0
1992			747,000	2,926.0	3.0
1993			756,000	3,014.0	.0
1994			765,000	3,104.0	3.0
1995	1,959,315	707,132	775,000	3,196.5	3.0
1996			783,000	3,292.0	3.0
1997			791,000	3,391.0	3.0

a. Calculated from: State of New York, Executive Department, Economic Development Board, "Preliminary Revised Demographic Projections," 1 March 1976.

b. Based on: McGraw-Hill Publications Department of Economics, "27th Annual Electrical Industry Forecast," Electrical World, 15 September 1976, pp. 43-58.

TABLE 1-6

HOME APPLIANCE - CUSTOMER SATURATIONS - NYSE&G SERVICE AREA

	kWh Per Home (a) 1974	% of Homes With One or More Appliances			
		1960 Census	1970 Census	1974 Survey	1995 Projected
Air Conditioners - Room	550[b]	3.3%	10.1%	27%	68%
Air Conditioners - Central	2000	0.7%	1.7%	1%	12%
Water Heating	4219	22%	20%	22%[e]	46%
Electric Ranges	1175	32%	39%	38%	59%
Electric Dryers	993	18%	35%	39%	59%
Gas Dryers	100	8%	17%	23%(Est.)	23%
Freezers	1195	25%	32%	47%	60%
Dishwashers	363	6%(Est.)	20%	29%	80%
Refrigerators	1525[c]	100%	100%	100%	100%
Clothes Washers	103	85%	80%	88%	88%
Televisions	515[d]	100%	100%	100%	100%
Electric Heat	15000	0.1%	1.9%	4.4%	33%
Misc. and Lighting	1988	100%	100%	100%	100%

a. The appliance consumptions listed do not include the estimated total 1975 energy conservation of approximately 618 kWh/year per home.

b. Adjusted to reflect approximately 1.3 room air conditioners per home in 1974.

c. Based on 1.23 refrigerators in use per home in 1974.

d. Adjusted to reflect homes with multiple televisions.

e. The water heating saturation was reduced to 18%, through judgment, for purposes of analysis.

Product (GNP) and the number of households. Although no strong year-to-year dependency has been detected, a growth rate of 5.9 percent has been established. The PSC, on the other hand, has included as variables: price of electricity, income, number of residential customers, and urbanization as prime determinants of commercial sales. Using a single equation model, a 3.6 percent annual growth rate has been projected for commercial sales. However, the model does not account specifically for any interfuel substitutions which are anticipated to occur as competitive fuels become less available and prices rise. Therefore, the State expects commercial sales for NYSE&G to increase in the range of 5.0 to 5.5 percent annually.

Industrial Sales

1.018
Projections of industrial sales are dependent mainly on the prospects for industrial development in the NYSE&G Corporation's service territory. The applicant estimates from historical data that its industrial sales have risen 1.3 percent for each one percent increase in GNP, but the company does not know whether this represents faster growth in its franchise territory than for the nation or if the mix of industry present in its territory has used electricity more intensively. PSC assumes that the 3.3 percent growth rate projected by NYPP for upstate New York between 1975 and 1985 will be higher (4.3 percent) and therefore give an expected industrial sales in 1985 in the range of about 3400 GWhr.

1.019
Corps staff has reviewed the year-to-year annual energy requirements projected by the applicant for the 1978 to 1992 period. The projected increases from year-to-year were compared to the energy forecasts made by the Federal Energy Administration (FEA) in the report, "1976 National Energy Outlook." The applicant's year-to-year projected increases are shown on table 1-6A.

The FEA Report provides projections of future national energy demand for the period 1974 to 1985, based on three scenarios: business-as-usual; conservation case; and the electrification case. The business-as-usual case incorporates conservation as a result of higher energy costs but does not account for energy conservation actions and laws. The conservation case is a modified business-as-usual case which incorporates conservation actions. The electrification case accounts for the increased substitution of coal and electricity in place of oil and gas. In light of recent national concern for oil and natural gas and the predicted future shortages, it is highly likely that future energy demand will more closely resemble the electrification case. The business-as-usual case projects national electric peak demand to increase at 5.9 percent per

TABLE 1-6A
APPLICANT'S PROJECTED
ENERGY REQUIREMENTS

Year	Energy Requirement (GWh)	Percent Change
1978	12020	-
1979	12520	4.16
1980	13220	5.6
1981	13820	4.5
1982	14520	5.0
1983	15220	4.8
1984	15920	4.6
1985	16720	5.0
1986	17520	4.8
1987	18320	4.6
1988	19220	4.9
1989	20120	4.7
1990	20920	3.9
1991	21820	4.3
1992	22620	3.6

year. The conservation and electrification scenarios result in annual increases of 3.9 percent and 6.9 percent, respectively.

The applicant's projections are lower than the business-as-usual case but average about one percentage point higher than the conservation case. Although the applicant's projections lie within the range predicted by the FEA, economic and demographic conditions in the applicant's service area are different from those on a national level, and the projections are not directly comparable.

PROJECT SITE DESCRIPTION

1.020
The Somerset Site is in the town of Somerset, Niagara County, New York at a latitude 43°-21-43" N and Longitude 78°36'-16" W on the southern shore of Lake Ontario (Figure 1-2). The site is located in a predominantly rural area, 28 miles (45 kilometers) northeast of Niagara Falls and 52 miles (94 kilometers) west-northwest of Rochester. The site, consisting of 963 acres (390 hectares) (Figure 1-3), is trapezoidal in shape extending 10,000 feet (3,048 meters) along the shoreline, southerly from 4200 feet (1280 meters), to 6300 feet (1920 meters) to Lake Road, with 8000 feet (2438 meters) frontage on Lake Road. The site rises gently from elevation 260 feet (79 meters), the top of the shoreline bluffs, to elevation 300 feet (91 meters) at Lake Road. Land uses on the site are generally characteristic of rural western New York. (See Table 1-7). The primary zoning for the site is agricultural, although a portion of the middle of the site is zoned industrial and the shoreline area is zoned residential.

1.021
A railroad/transmission corridor approximately 0.3 miles (0.5 kilometers) in width extends south from the southwest portion of the site about 1.3 miles (2.1 kilometers) to the existing railroad line in West Somerset. This corridor has an area of approximately 221 acres (89 hectares), consisting primarily of open fields and agricultural land.

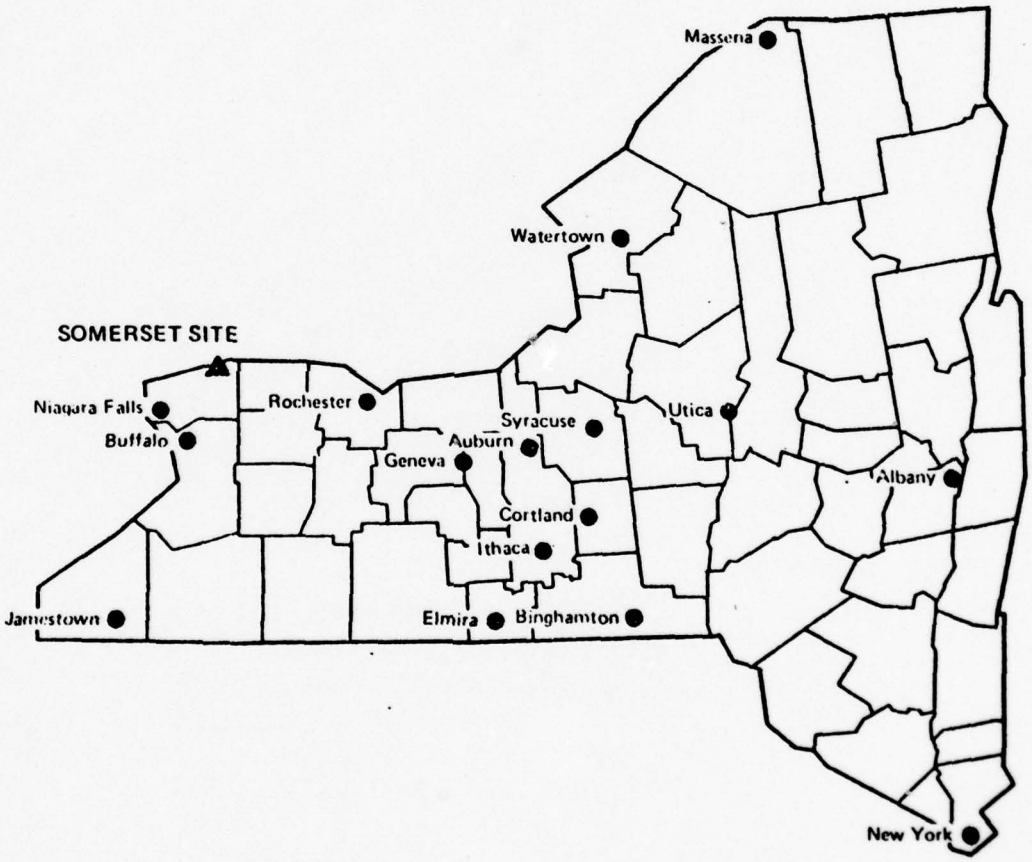
THE ELECTRIC GENERATING STATION

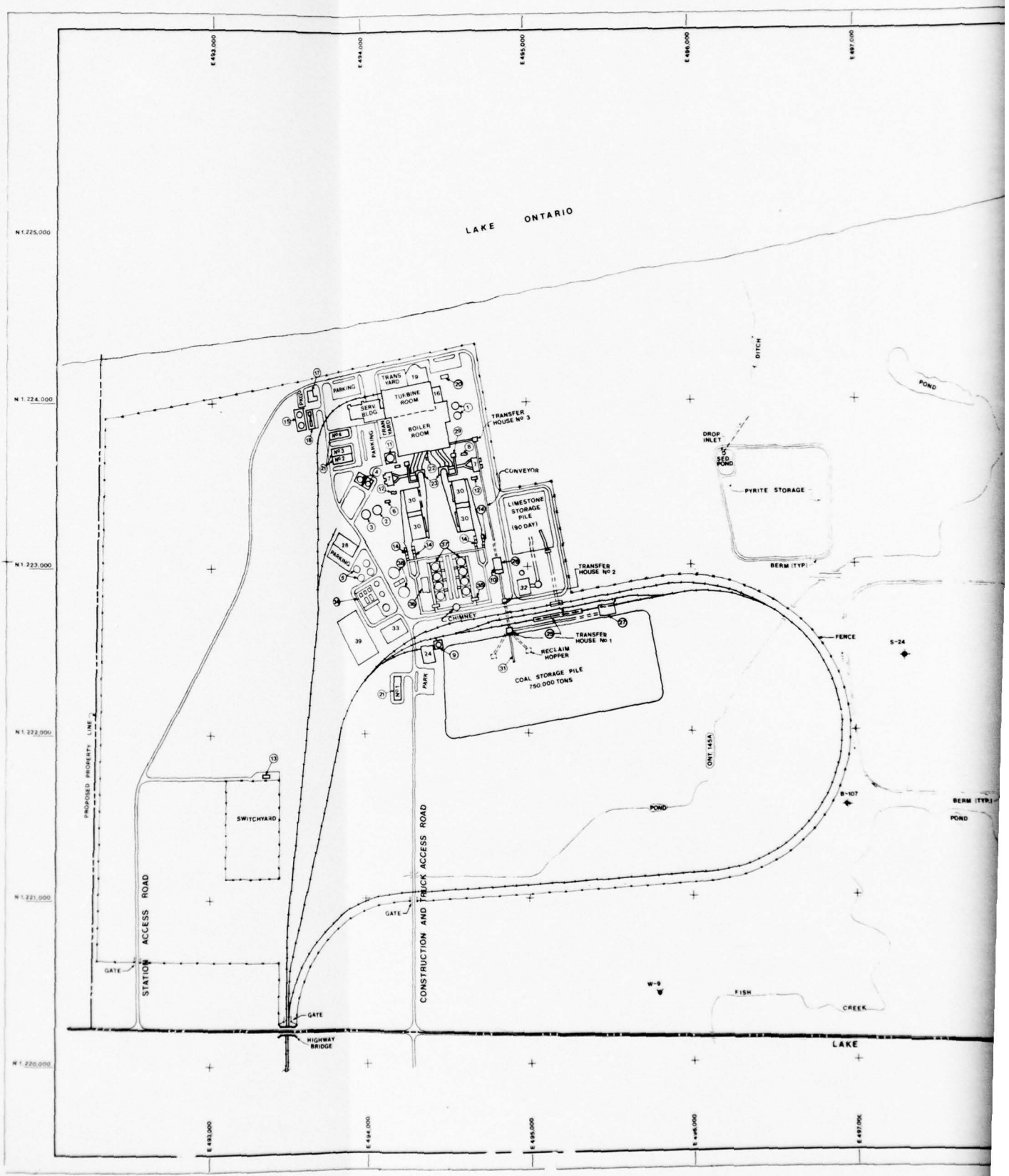
Proposed Plant Operation

1.022
The proposed Cayuga Station at Somerset is designed as a single unit facility rated at 850 megawatts (MW).

FIGURE 1-2

LOCATION OF THE SOMERSET SITE
(REGIONAL AREA)




E 493,000
E 494,000
E 495,000
E 496,000
E 497,000
N 1,225,000
N 1,224,000
N 1,223,000
N 1,222,000
N 1,221,000
N 1,220,000
LAKE ONTARIO
PROPOSED PROPERTY LINE
STATION ACCESS ROAD
CONSTRUCTION AND TRUCK ACCESS ROAD
PARKING
TRANS YARD
SERV BLDG
TURBINE ROOM
BOILER ROOM
TRAIN YARD
TRANSFER HOUSE No 3
CONVEYOR
LIMESTONE STORAGE PILE (90 DAY)
TRANSFER HOUSE No 2
CHIMNEY
TRANSFER HOUSE No 1
RECLAIM HOPPER
COAL STORAGE PILE 750,000 TONS
SWITCHYARD
GATE
HIGHWAY BRIDGE
DITCH
POND
DROP INLET
SED POND
PYRITE STORAGE
BERM (TYP)
FENCE
S-24
B-107
ONT 145A
W-9
FISH
CREEK
LAKE

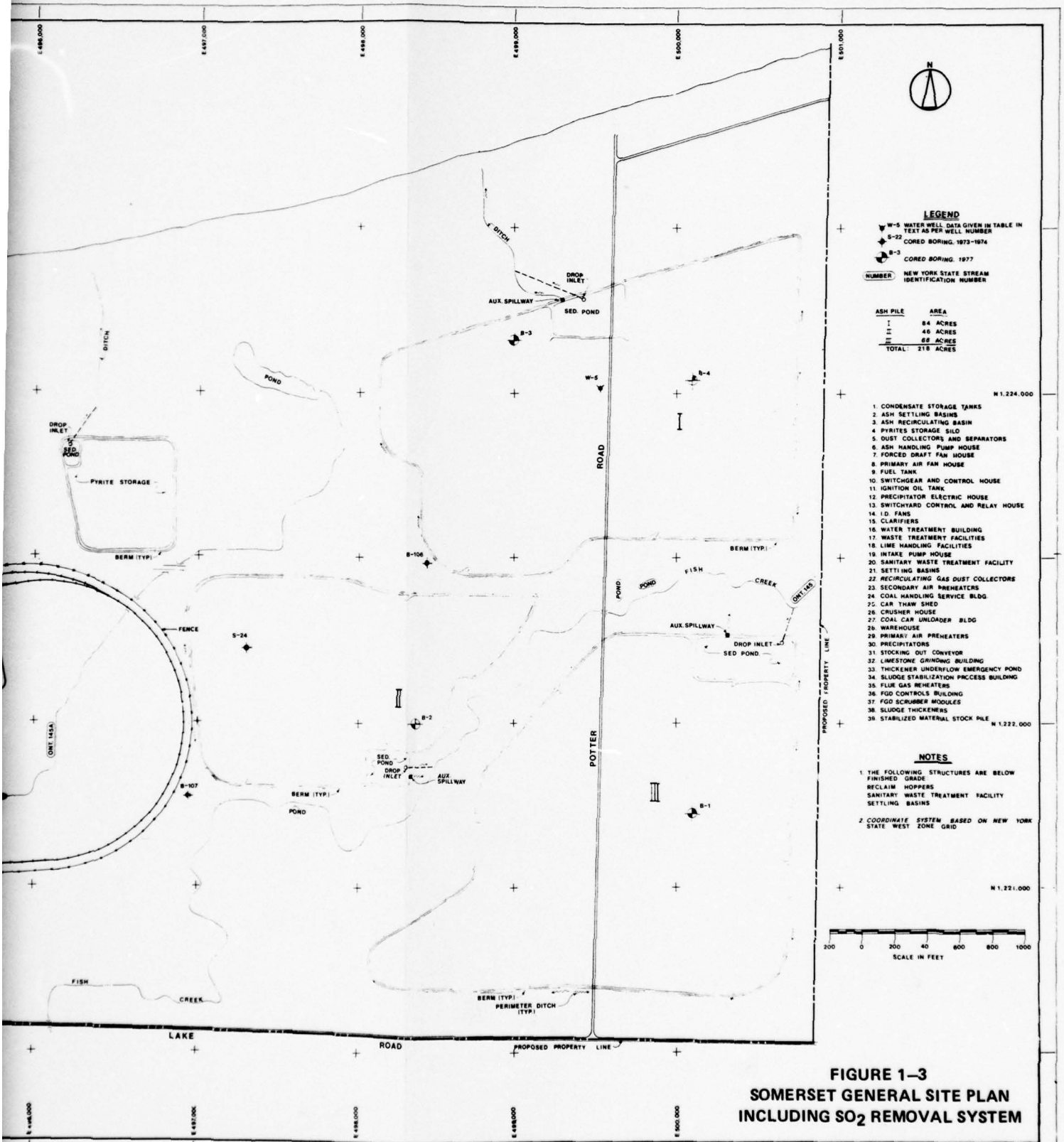


FIGURE 1–3
SOMERSET GENERAL SITE PLAN
INCLUDING SO_2 REMOVAL SYSTEM

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TABLE 1-7

LAND USE AND GENERAL COVER TYPES WITHIN THE SITE BOUNDARY
AUGUST 1975

Land Use[a]	Site Boundary	
	Area (Acres)	Percent of Total Area
Residential	30	3
Commercial and Industrial	1	<1
Active agricultural land:		
Annual cropland	472	49
Orchard, vineyard, and blueberry	0	0
Hay and pasture	67	7
Evergreen plantation		
Active Agricultural Land Total	539	56
Natural vegetation and inactive agricultural land:		
Open field	245	25
Deserted orchard	32	3
Fence row	8	1
Woodland	60	6
Lakeshore	5	1
Stream border:		
Woodland	35	4
Shrub		
Natural Vegetation and Inactive Agricultural Land Total:	392	41
Ponds		
TOTAL LAND USE	963	100

a. Excludes Lake Ontario

The station is designed to operate as a base loaded station with an anticipated life of 30 years. The plant's capacity factors are expected to be as tabulated below.

Year	Capacity Factor (Percent)
1	60
2	65
3	70
4-20	73
21-25	65
26-30	60

Main Boilers and Turbine

1.023
The proposed generation station will be comprised of a single coal-fired boiler and a single steam-driven turbine-generator set. The steam generator will be designed to burn coal. Inherent in this design is the capability to burn a wide range of coals. The boiler's conceptual design provides for a maximum net continuous capability (5 percent overpressure, valves wide open) of 6,125,000 pounds per hour of superheater steam flow, 2,618 psig superheater outlet pressure at a temperature of 1005°F (540°C). The turbine-guaranteed name plate rating of 850 MW designed to operate at 2,400 psig and 1000°F (538°C) condensing at 1.5" (3.8 cm) HgA back pressure. There will be seven stages of feedwater heating. The boiler can be converted to burn #6 fuel oil. The conceptual designs of the boiler and turbine-generator are provided in Appendix A, Tables A-1 and A-2, respectively.

Auxiliary Boiler

1.024
The plant will have two oil-fired auxiliary boilers. Each unit will have an approximate continuous rate capacity of 150,000 pound per hour of steam, superheater outlet pressure of 150 psig at a temperature of 475°F (246°C). The emergency generator and fire pump will be diesel-driven. The conceptual design is provided in Appendix A, Table A-3.

FUEL

1.025
New York State Electric and Gas Corporation has concluded that the proposed Cayuga station at Somerset site should utilize a coal-fired electric generating unit. The reasons for selecting coal are discussed in Chapter Six entitled "Alternatives." Since a flue gas desulfurization (FGD) system is required, the applicant has chosen to use a high sulfur eastern coal for economic reasons. Low sulfur coal is more expensive and the use of western coal involves greater transportation costs. The coal to be selected will be suited to the applicant's proposed best available control technology (BACT) and will assure attainment of the New Source Performance Standards (NSPS) for SO_2 emissions of 1.2 pounds $SO_2 10^6$ BTU.

The applicant is currently soliciting proposals for a ten-year minimum coal supply. The coals being considered are found in three principal areas of the Eastern Bituminous Coal Region. These areas are the Main Bituminous Field of Central Pennsylvania, the Northern Coal Field of Northern West Virginia and Ohio Coal Field in Eastern Ohio. The average percent sulfur and Btu/lb, for the above regions, cover a range of 1.8 to 3.2 and 11,346 to 12,214, respectively. Ash and sulfur content will have a great influence on the selection of a coal. However, coal costs and coal characteristics that affect operation of the boiler, pulverizers and ash handling facilities are important factors that must be examined when a coal is evaluated.

Although a final determination for a coal source has not been made, the boiler's conceptual design is based on coal with a maximum heat input of 7,953 Mega Btu/hr. Therefore assuming that the coal source providing the least amount of heat energy (11,000 Btu/lb) was selected, 8,676 tons (7,869 metric tons) of coal per day would be the maximum possible firing rate.

PRINCIPAL STATION STRUCTURES

1.026
The facilities described in this section represent reasonable conceptual engineering practice. During final plant design, these concepts and associated systems will be optimized based on detailed engineering, economic, and environmental considerations. All construction procedures will be in compliance with applicable occupational Safety and Health Administration (OSHA) regulations.

Main Power Generating Station

1.027
The arrangement of the proposed facility is shown on the general site plan, Figure 1-3. The main buildings, housing the turbine generator

and boiler will be constructed with insulated metal siding and masonry. Portions of the turbine room and boiler room will have wall louvers as required for plant and equipment ventilation. Brick will be used at the base of the main plant. Aside from the exhaust stacks the boiler room will be the tallest structure, approximately 300 feet (91 m) tall. Plant and accessory buildings will be earth brown colors.

1.028
The service and administ ation building will be a one-story structure attached to the west side of the turbine room. The administrative offices and the necessary plant service facilities will be housed therein. The building exterior will be brick with solar gray glass windows. The water treatment building will be a one-story structure. The building will have exterior walls of brick. Sanitary facilities will be located on the north side of the main building complex. The sewage treatment building will be a prepackaged low-profile structure. The liquid waste treatment facilities will include a chemical storage silo, lime reaction and oxidation tanks, settling basins, and other accessories. With the exception of the silo, these structures will be low-profile, rectangular, open top tanks. The waste treatment building will be a one-story structure constructed of structural steel framing with the exterior walls of brick veneer, and will be located north of the main building.

1.029
The buildings for the coal and limestone handling facilities and equipment will be covered with the same type and color of metal siding as the main power plant building. Above ground, the conveyors will be supported by steel trusses. The trusses and conveyors will be enclosed by metal panel walls and roofs. The truss support towers and intermediate bents will be exposed structural steel, painted brown. Below ground the conveyors will be located in reinforced concrete tunnels. Ash silos will be two-story buildings, topped with glazed structural tile tanks. The exterior walls of the buildings will be covered with the same glazed tile, surfaced in a brown tone. The intake pumphouse will be an underground reinforced concrete structure with a brick-faced superstructure.

Electrostatic Precipitators

1.030
The proposed Best Available Control Technology (BACT) for the removal of particulates will be a high efficiency electrostatic precipitator installed in the flue gas system on the cold side of the regenerative air heaters to limit particulate emissions to 0.05 $lb/10^6$ BTU. The specification for the precipitator and the precipitator guarantee will include a minimum efficiency of 99.7 percent for the range of

coals expected to be used by the facility. To be assured that the precipitators will maintain their efficiency, they will be tested after first going into service. They will be retested after an extended period of normal operation, which is expected to be approximately one year after initial operation.

The efficiency of the precipitator will be specified at the plant conceptual design point (CDP) loading. Since the performance of a properly designed precipitator system does not decline with reduced loadings, full design efficiency will be maintained or exceeded over all ranges of unit operation, with maximum emissions in compliance with the standards. Particulate emissions will decrease commensurately with unit loadings. Also, an additional reduction of particulate emissions will result in the FGD system. However, this reduction cannot be quantified.

Once the final facility coal and ash characteristics are available, the precipitator will be sized and designed in order to meet the above design specifications. It is expected that the inlet gas temperature to the precipitator will be on the order of 270°F, with a corresponding gas flow of 3.1×10^6 acfm.

Flue Gas Desulfurization (FGD) System

1.031
The plant will be equipped with a flue gas desulfurization (FGD) system. The selected FGD system is the limestone (non-regenerable) type. The structures will be painted with a brown color compatible with the main plant structures. (See Figure 1-4).

Exhaust Stacks

1.032
The station will have one stack, constructed of a reinforced concrete exterior shell, with a base diameter of approximately 50 feet (15 meters) and a top diameter of 35 feet (11 meters). There will be an interior flue with an exit diameter of 25 feet (8 meters). The stack will extend 450 feet (137 meters) above ground level and will be equipped with three levels of high intensity strobe lights which will flash at a frequency of 40 per minute at an intensity of 200,000 candelas in the daytime, 20,000 candelas at twilight and dawn, and 4,000 candelas at night.

Switchyards

1.033
One 345 kV switchyard will be constructed approximately 2,200 feet (670 m) southwest of the main generating facilities. The switchyard

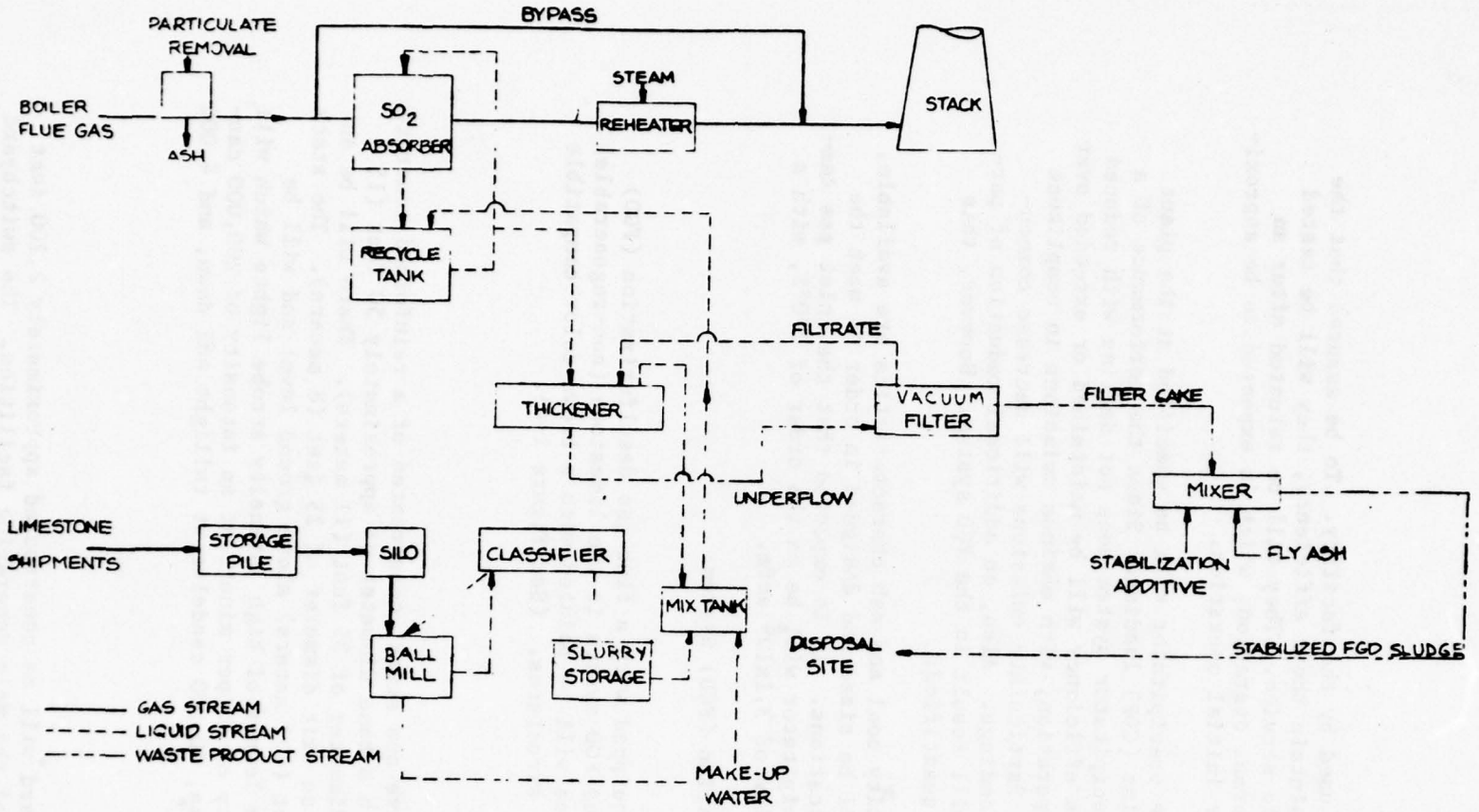


FIGURE 1-4
LIMESTONE FGD SYSTEM PROCESS DIAGRAM

will be approximately 450 feet (137 meters) by 625 feet (191 meters) and cover an area of about 6.5 acres (2.6 hectares). The transformer areas will be sealed with concrete or other impermeable materials.

Meteorological Sampling Station

1.034
At this time there is no specific plan for a permanent meteorological sampling station. However, the applicant will install a meteorological tower onsite and will monitor wind speed and wind direction for a minimum of one year prior to station operation.

Coal and Limestone Handling Facilities

1.035
The railroad access to the Somerset Site is through a transmission and railroad corridor running a distance of about 2 miles (3 kilometers) from the southern site boundary to a line owned by trustees of Penn Central. From Barker east, it has been abandoned by NYS DOT and is up for sale. If it is sold, there will be no rail service from the east. Service from the west would require replacing 0.6 miles of track and extensive rehabilitation. A final route has not yet been selected. Possible routes are discussed in paragraph 2.022. When construction of the proposed station is completed, unit trains of between 100 and 120 cars will bring 10,000 to 12,000 tons (9,078 to 10,894 metric tons) of coal directly to the station five or six times per week and limestone deliveries will consist of a maximum of 52 cars per week (about 4,000 tons per week). A ladder track system located in the railroad corridor is capable of storing an additional unit train should two arrive at the site at the same time. The Somerset Site will be provided with loop track unloading systems to facilitate coal and limestone handling operations. The unit train will be unloaded, without uncoupling, via a rotary car dumper housed in the coal and limestone unloading buildings. Each building is a one-story structure with dimensions of approximately 60 feet by 70 feet (18 meters by 21 meters). A thaw shed, approximately 300 feet (91 meters) long by 30 feet (9 meters) wide, located adjacent to the unloading buildings, will deice the coal, as required, before the cars pass through the dumper.

1.036
The coal will be unloaded at a rate of 3,000 tons/hour (2,723 metric tons/hour) and travel by conveyor from the dumpers to either the coal storage pile south of the plant or directly to the coal bunkers housed in the boiler room. Before entering the coal bunkers, the coal will pass through a magnetic separator and coal crusher housed in a building with dimensions of approximately 50 feet (15 meters) by

50 feet (15 meters) by 100 feet (30 meters) high. A 250 foot (76 meter) long stocking out conveyor, a reclaim hopper system, and bulldozers will be used at the coal pile for storage and handling of the coal. Also included in the coal handling system are a one-story, 75 foot (23 meters) by 100 feet (30 meters) service building and three 40 foot by 40 foot (12 meter by 12 meter) transfer houses. The limestone will be unloaded in a similar manner. However, the unloading rate and service building(s) dimensions are not presently available.

Coal and Limestone Storage Facilities

1.037
Since the Somerset Site is essentially flat, extensive earth moving will not be required in preparation for the coal and limestone storage pile construction. An area approximately 1,350 feet (411 meters) by 600 feet (183 meters) for the coal pile and approximately 250 feet (76 meters) by 400 feet (122 meters) for the limestone pile will be cleared of brush and topsoil and surfaced with an impervious liner in preparation for the storage of coal or limestone. The finished coal pile will be approximately 45 feet (14 meters) high and have a capacity of 750,000 tons (680,850 metric tons) which represents a 90-day reserve of coal at full capacity. The limestone pile will also have a 90-day supply, equal to approximately 55,000 tons (49,930 metric tons). A concrete dike will be constructed around the perimeter of the coal and limestone pile to retain runoff. Runoff will be collected in a depression along the dike and drained to three permanent settling basins. Effluent from the basins will flow to physical/chemical treatment facilities and subsequently be reused or discharged to Lake Ontario.

1.038
Coal dust will be suppressed through the application of a light surfactant solution to the coal at all transfer points. The surfactant will be automatically mixed with water in ratios which provide the optimum dust supression characteristics. Following mixing, the surfactant solution will pass to spray header assemblies which are specifically engineered and designed to spray solution as required to control dust created where material is handled, loaded, conveyed, or transferred. Coal delivered to the coal pile by the stocking out system will contain a surface active wetting agent mixed with water to suppress dust. Coal will be layered and compacted by mobile coal handling equipment to reduce fire potential and dust generation. At the present time, there are no dust suppression measures planned for the limestone pile since fugitive dust is not expected to be a problem. However, if such a problem should arise, immediate action will be taken to rectify the situation.

1.039
Ignition (No. 2) fuel oil will be stored in a 150,000 gallon (567,750 liter) above-ground tank which will be surrounded by a dike. The diked area will be large enough to contain the entire 150,000 gallons of oil in the event of a spill. Fuel for mobile equipment and locomotives will be stored outdoors in a diked, above-ground tank, with an estimated capacity of 20,000 gallons (75,700 liters).

Coal and Limestone Pile Runoff and Drainage System

1.040
Coal and limestone pile runoff will be collected by the runoff/infiltration collection system and will undergo physical and chemical treatment prior to discharge. The collection and treatment of coal pile runoff are described in "Treatment of Liquid Wastes," later in this chapter.

ACCESS ROADS

1.041
Approximately 2-3/4 miles (4.4 kilometers) of access roads will be constructed or upgraded as part of the station facilities, of which two miles will become permanent after construction of the plant (see Figure 1-3). Additionally, the existing Hosmer Road which traverses the site will be used as the major access road during construction and for truck traffic during operation. A total of nine acres (three hectares) of land will be cleared and regraded by conventional earth moving equipment for road construction. Materials removed suitable for construction purposes will be used as appropriate. Trees and other cleared vegetation will, if marketable, be sold, burned, windrowed, or chipped as is practical or environmentally appropriate. Chipped wood products will be used as mulch when appropriate. Remaining vegetation will be transported to the spoil area. All topsoil displaced by construction activities will be stockpiled and reused as part of the revegetation program planned for the site.

1.042
Permanent access roads will be 40 feet wide (12 meters), including shoulders, and will be constructed of a compacted gravel base with two courses of bituminous concrete surface (binder and wearing). Routine maintenance of permanent roads will entail periodic patching and/or resurfacing as required.

1.043
During construction, nonvegetative measures will be undertaken to minimize erosion during temporary surface disturbances until roads are paved. Construction access roads will be stabilized with water-bound gravel, crushed stone, or asphalt pavement to minimize erosion.

All proposed slopes (cut or fill areas) will be graded and stabilized by revegetation, contour stripping, or protective rock blankets.

1.044
Access to the Somerset Site during construction will be by the existing Hosmer Road, which can expect to receive approximately 148 truck trips and 2,056 passenger car trips per day during the peak construction year of 1981. During operation, access to the plant will be through the main entrance which will be located near the end of the site. This road will experience approximately 140 passenger car trips per day during operation of the unit.

SHORELINE PROTECTION

1.045
The applicant's proposal for riprap shore protection has been withdrawn and the pumphouse has been moved inland, as shown in the revised Figure 1-3.

DREDGING

1.046
Overburden material in Lake Ontario will be dredged from the rock to permit construction of the intake and discharge structures and conduits for the circulating water system. In addition, rock will be blasted from the bottom to enable the conduits to be entrenched in the nearshore region. A total of 7,000 cubic yards (5,352 cubic meters) of sediment (sand and silt) and 21,000 cubic yards (16,057 cubic meters) of rock will be removed from the lake for construction of the intake and discharge systems. This will effect approximately 94,000 square feet (8,733 square meters) of lake bottom sediments. The disposal of dredged material is discussed in paragraph 1.090. Department of the Army permits are required for the dredging associated with circulating water system construction in accordance with Section 10 of the River and Harbor Act of 1899.

COOLING WATER SYSTEMS

1.047
The cooling water system proposed for the Cayuga Station at Somerset consists of a once-through circulating water system.

Condenser

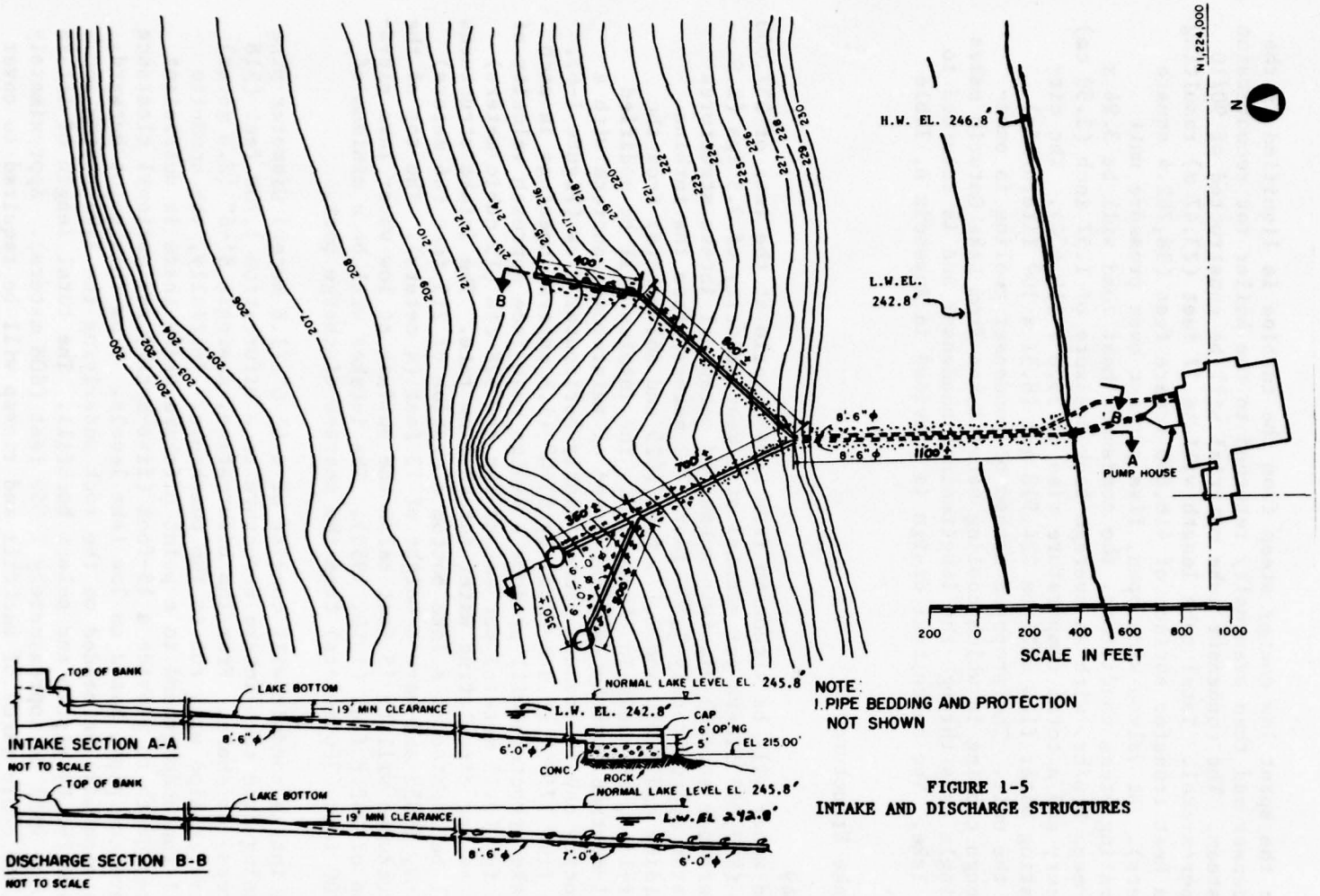
1.048
Steam produced in the boiler under conditions of high temperature and pressure is used to drive the turbine-generator thereby generating electrical energy. The steam cycle is a closed-loop operation in

that the spent low energy steam from the turbine is liquified in the condenser and then eventually returned to the boiler for reconversion to steam. The condenser tube material will be constructed of 90/10 copper/nickel. Total tube length will be 77 feet (23.47 m) resulting in a heat transfer surface of 416,800 square feet (38,762.4 square meters). At valves wide open, five percent over pressure unit operating steam conditions, the condenser heat load will be 3.94 x 10^3 mega Btu/hr. with an average back pressure of 1.57 inch (3.98 cm) mercury and a total temperature rise of 35.0°F (19.4°C). The circulating water flow will be 224,918 gpm (8.51 x 10^5 liters/min) for the unit. The proposed method of condenser cooling is once-through cooling in which cooling water taken from Lake Ontario makes a single pass through the longitudinal condenser and is returned to the lake. The conceptual design is provided in Appendix A, Table A-4.

Intake Structure

1.049
Cold water will be withdrawn from Lake Ontario at the rate of 237,000 gpm (897,045 liters per minute) at a mean velocity of 9.5 fps (2.9 meters per second) via twin submerged octagonal intake structures located approximately 2,500 feet (762 meters) from the turbine building and 2,050 and 2,175 feet (625 and 663 meters) from the shoreline, as shown in Figure 1.5. The intakes will be modified bell-mouthed structures constructed of reinforced concrete with a velocity cap to produce predominantly horizontal flow (Figure 1-6). The five 17'-6" (5.3 meters) by 6'-0" (1.8 meters) openings in each intake structure will produce a design mean face approach velocity of 0.5 fps (0.15 meters) per second for the 528 cfs (15 cubic meters) per second circulating water intake flow rate. The intake structures will be located at a lake bottom elevation of 215 feet (66 meters) (IGLD, 1955) and have a height of 13 feet (4 meters). The top of the structures will be 15 feet below the surface at low water lake elevation of 242.8 feet (IGLD, 1955). The intakes will be a minimum of 1,200 feet (366 meters) from the nearest discharge port.

The intake conduit will consist of a 6'-0" (1.8 meter) diameter pipe running from each intake structure to a bifurcation 1,700 feet (518 meters) offshore. From the bifurcation, a single 8'-6" (2.6 meter) diameter pipe will run to the pumphouse. Initially, the conduits will run underground to a point offshore where there is sufficient water depth to provide a 15-foot (five-meter) navigational clearance above the pipe, based on low lake levels. From this point outward, the pipe will be bedded on the rock underlying the lake bottom and protected by riprap and select backfill. The total length of intake piping will be approximately 2,650 feet (808 meters). Approximately 30,000 cubic yards of backfill and riprap will be required to cover the intake and discharge pipelines.

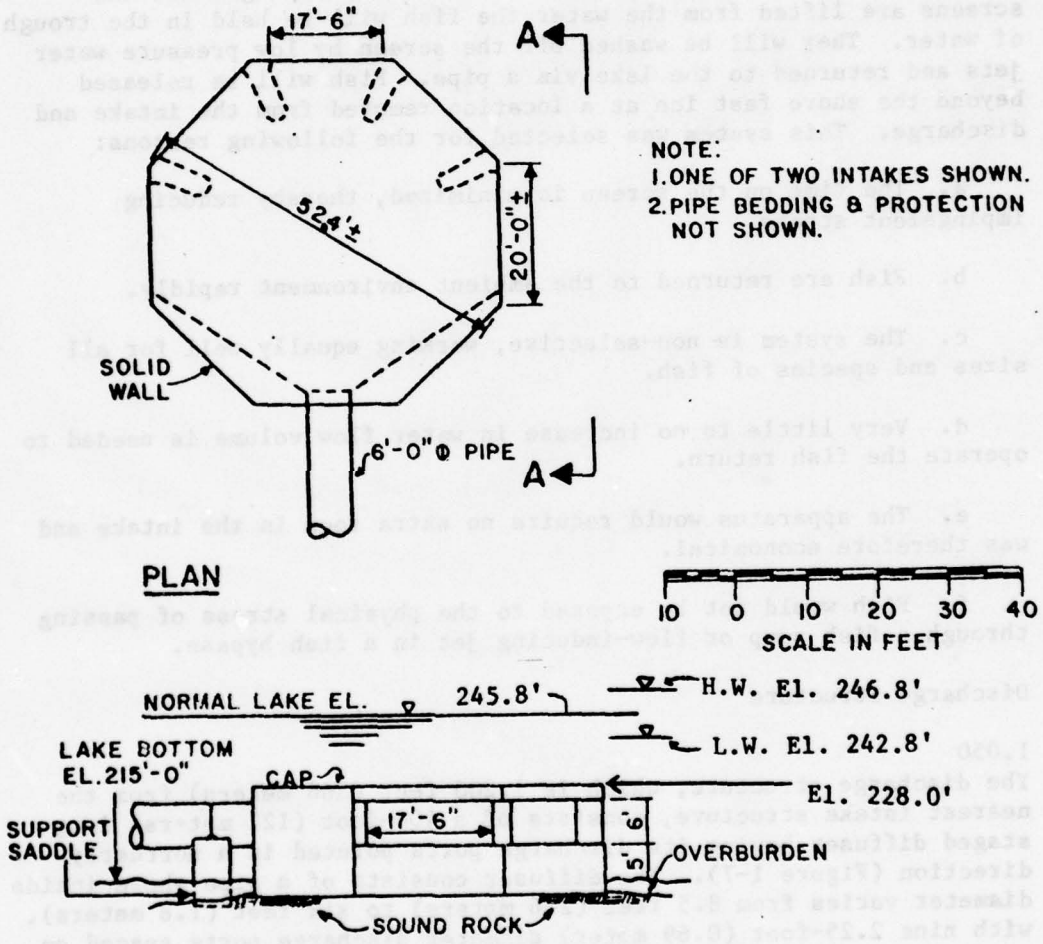


NOTE:
1. PIPE BEDDING AND PROTECTION NOT SHOWN

FIGURE 1-5
INTAKE AND DISCHARGE STRUCTURES

FIGURE 1-6

INTAKE STRUCTURES



Datum: IGLD, 1955

Two 120,000 gpm (454,200 liters per minute) circulating water pumps will be located in the pumphouse. Intake screens with an 0.375 inch (0.953 centimeter) mesh will be used at the Somerset Site. The applicant has agreed by stipulation in the New York State Article VIII hearings to the installation of a fish return system in the intake pumphouse. This system will consist of troughs attached to vertical traveling screen panels. As fish are impinged and the screens are lifted from the water the fish will be held in the trough of water. They will be washed off the screen by low pressure water jets and returned to the lake via a pipe. Fish will be released beyond the shore fast ice at a location removed from the intake and discharge. This system was selected for the following reasons:

a. The time on the screen is minimized, thereby reducing impingement stress.

b. Fish are returned to the ambient environment rapidly.

c. The system is non-selective, working equally well for all sizes and species of fish.

d. Very little to no increase in water flow volume is needed to operate the fish return.

e. The apparatus would require no extra room in the intake and was therefore economical.

f. Fish would not be exposed to the physical stress of passing through a fish pump or flow-inducing jet in a fish bypass.

Discharge Structure

1.050
The discharge structure, which is 1,200 feet (366 meters) from the nearest intake structure, consists of a 400-foot (122 meters) long staged diffuser having its discharge ports pointed in a northerly direction (Figure 1-7). The diffuser consists of a pipe whose inside diameter varies from 8.5 feet (2.6 meters) to six feet (1.8 meters), with nine 2.25-foot (0.69 meter) diameter discharge ports spaced on 50-foot (15 meter) centers. The inboard end of the diffuser is located at a bottom elevation of 218 feet (66 meters) (IGLD, 1955) at a distance of 1,700 feet (518 meters) from shore. The outboard end is located at a bottom elevation of 214 feet (65 meters) (IGLD, 1955) at a distance of 2,100 feet (640 meters) from shore. The center line of the discharge ports is at elevation 227 feet (69 meters) (IGLD, 1955) which will provide a yearly mean submergence of 20 feet (six meters), with submergence ranging from 16 to 21 feet (five to six

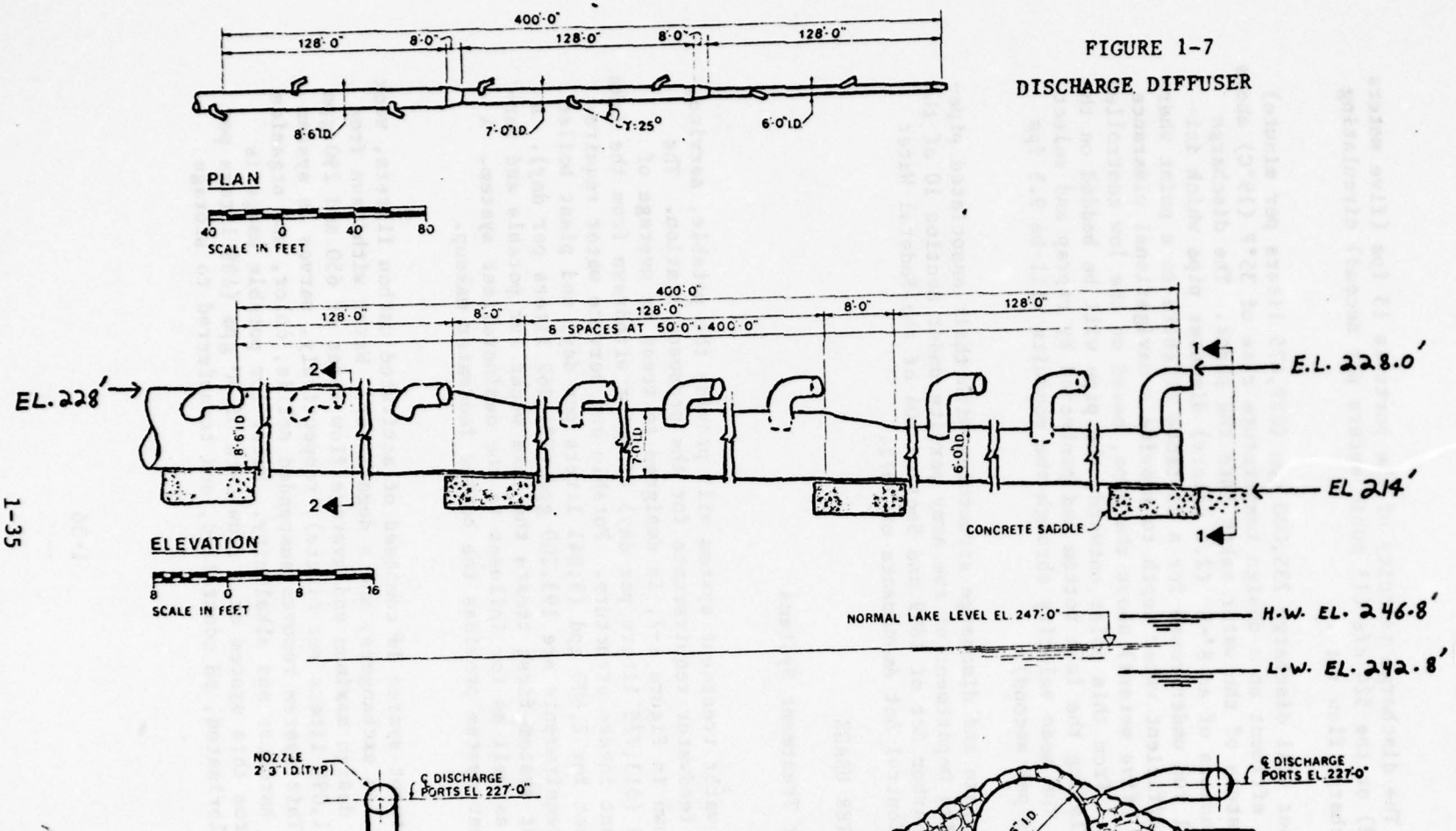


FIGURE 1-7

DISCHARGE DIFFUSER

meters). The discharge velocity of the ports is 15 fps (five meters per second) or the 524 cfs (15 cubic meters per second) circulating water discharge flow rate.

The diffuser will discharge 235,000 gpm (889,475 liters per minute) of thermal effluent at a design temperature rise of 35°F (19°C) above the temperature of the water taken into the plant. The discharge conduit consists of an 8'-6" (2.6 meters) diameter pipe which initially will run underground for a distance offshore to a point where there is sufficient water depth to provide a navigational clearance of 15 feet (five meters) above the pipe, based on the low controlled lake level. From this point outward, the pipe will be bedded on the rock underlaying the lake bottom and protected by riprap and select backfill. The mean velocity through the conduits will be 9.5 fps (2.9 meters per second).

Both the intake and discharge structures with their associated pipelines require Department of the Army permits under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act Amendments of 1972.

PROCESS WATER USAGE

Plant Water Treatment Systems

1.051
The makeup water treatment system will provide the potable, service, and boiler feedwater requirements for the proposed station. The system, shown in Figure 1-7, is designed to treat an average of 215,000 gpd (813,775 liters per day) of water withdrawn from the lake via the plant intake structure. Potable and service water requirements account for 2,600 gpd (9,841 liters per day) and plant boiler feedwater requirements are 193,200 gpd (731,262 liters per day). A pretreatment system first treats the lake water for potable and service usage as well as for influent to the demineralizer system. A demineralizer system provides the boiler feedwater makeup.

1.052
The pretreatment system is composed of activated carbon filters, weak acid cation ion exchangers, and a degasifier. Water withdrawn from the lake at design maximum and average flow rates of 650 and 290 gpm (2,460 and 1,098 liters per minute), respectively, serves as system influent. This system removes suspended solids, color, and organics and reduces hardness and alkalinity. Water for potable usage is withdrawn from this system at a flow rate of 50 gpm (189 liters per minute), chlorinated, pH controlled, and transferred to storage facilities.

1.053
Pretreated water is also conveyed to the demineralizer system at design and average flow rates of 600 and 240 gpm (2,271 and 908 liters per minute), respectively. The system consists of two trains of ion exchange vessels, each train containing strong acid cation, weak base anion, and mixed-bed exchangers. Silica and total dissolved solids are reduced to approximately 0.01 mg/l (as SiO_2) and 0.04 mg/l (as $CaCO_3$), respectively.

1.054
Chemicals used in the makeup water treatment system are as follows: (a) approximately 36 pounds (16 kilograms) per day of alum, two pounds (one kilogram) per day of polyelectrolyte, one pound (0.5 kilogram) per day of chlorine, and 0.1 pound (0.05 kilogram) per day of caustic for chemical coagulation in the clarifier; (b) approximately 0.1 pound (0.05 kilogram) per day of caustic (NaOH) for potable water pH control; (c) one pound (0.5 kilogram) per day of chlorine for chlorination; and (d) approximately 580 pounds (263 kilograms) per day of 93 percent sulfuric acid and 265 pounds (120 kilograms) per day of 100 percent caustic for ion exchange resin regeneration. Quantities of waste produced and their treatment are discussed in "Operational Phase Liquid Waste."

1.055
The condensate polishing system, shown in Figure 1-8, treats up to 100 percent of the condensate from the condenser hotwell on a continuous basis. Operating flexibility allows the actual treated flow to range from 5,000 to 10,000 gpm (18,925 to 37,850 liters per minute).

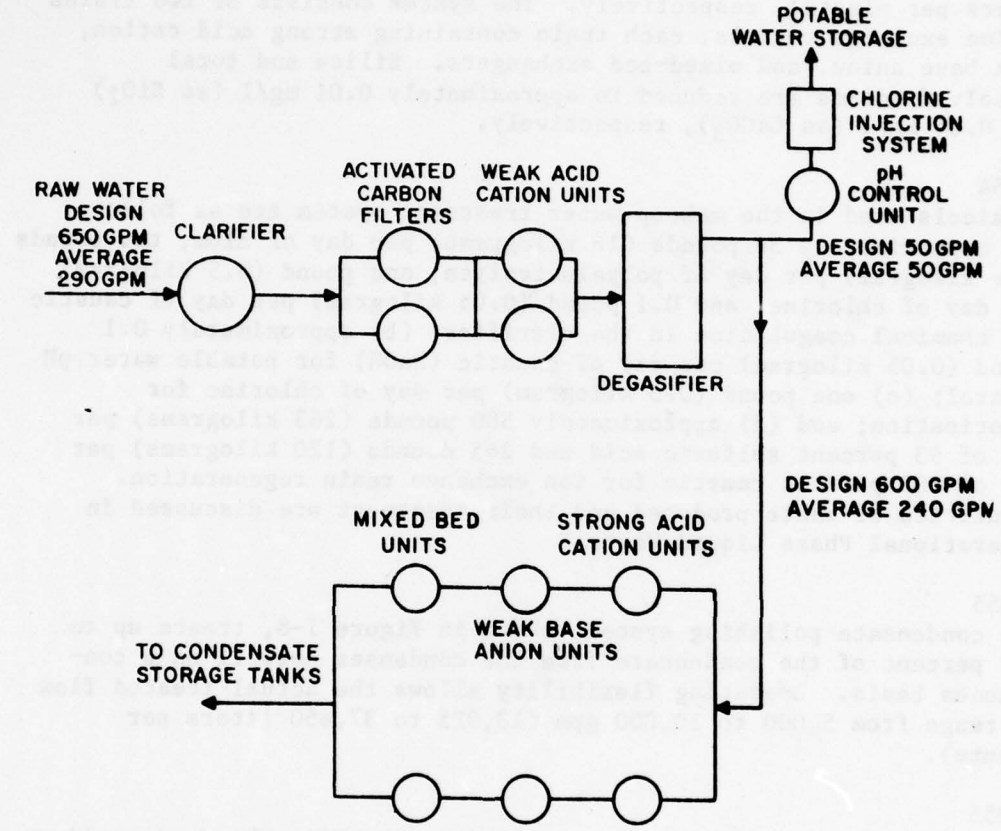
1.056
The ion exchange resins are regenerated external to the demineralizer vessels approximately once per month. Approximately 4,500 pounds (2,041 kilograms) of 93 percent sulfuric acid and 2,800 pounds (1,270 kilograms) of 100 percent NaOH are expected to be utilized per month.

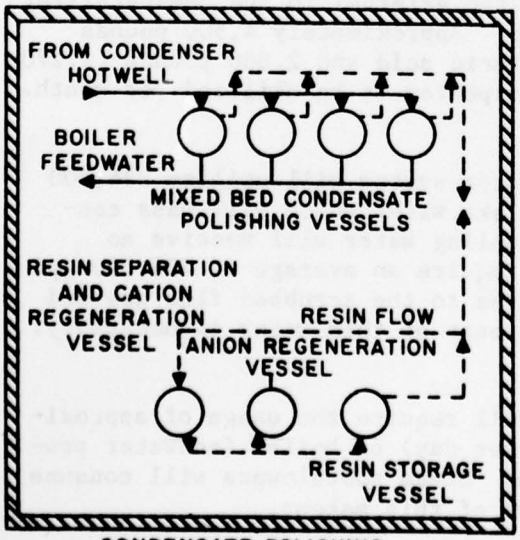
1.057
The proposed once-through cooling water system will utilize 224,900 gpm (851,247 liters per minute) of lake water which will pass continuously through the condenser. Cooling water will receive no pretreatment. The FGD system will require an average of 794,000 gpd as makeup water top account for losses to the scrubbed flue gas and the stabilized FGD sludge. No treatment of this water is necessary.

1.058
Operation of the station's boiler will require the usage of approximately 193,000 gpd (730,505 liters per day) of boiler feedwater produced by the water treatment system. Steam sootblowers will consume 150,000 gpd (567,750 liters per day) of this makeup.

FIGURE 1-8

WATER TREATMENT SYSTEM
CONCEPTUAL PROCESS DIAGRAM





CONDENSATE POLISHING
DEMINERALIZER PROCESS
DIAGRAM

To prevent excessive concentration of impurities in the boiler water, it will be necessary to draw off some of the water and replace it with high purity makeup. Boiler water additives will be of the volatile type (i.e., ammonia and hydrazine) and will be present only in trace concentrations. The total dissolved solids concentration will be approximately 20 mg/l, with a pH of 9.0 to 9.5, and suspended solids will be negligible. Blowdown will be maintained at a relatively continuous flow of 30 gpm (114 liters per minute), 43,000 gpd (162,755 liters per day) and will be directed to the liquid waste treatment system discussed in "Low Conductivity Waste Reclamation System."

SEDIMENTATION AND EROSION CONTROL

1.059
To control erosion and stormwater runoff from areas disturbed by construction activities, techniques which are described in the EPA publication "Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity" (EPA 430/9-73-007) will be employed. In general, runoff from areas not disturbed by construction activities will be segregated from runoff from construction areas which may be potentially contaminated. Segregation will be effected by the utilization of both natural and manmade drainage channels. Uncontaminated runoff will be discharged directly into the lake. Potentially contaminated runoff will be treated to ensure that, prior to its discharge to the lake, it has a suspended solids concentration of less than 50 mg/l as required by paragraph 423.45 of the EPA Effluent Guidelines and Standards. The applicant has made no provision for pH adjustment of uncontaminated runoff prior to discharge to the lake based on the rationale that this discharge will be typical of natural runoff.

1.060
The following methods will be developed to control storm water and erosion:

General - Topsoil will be salvaged, stockpiled, protected, and respread to assist in establishment of vegetative measures. Disturbed areas of soil will be kept to the minimum possible and shall be promptly vegetated with suitable species of grasses, legumes, and/or plants.

Settling Basins - To receive rainfall potentially contaminated by construction activities, settling basins, formed either by diking natural drainage canyons or by digging inground earthen structures, will be employed throughout the construction site. Each settling basin receiving inflow from a specific drainage area will be designed to provide for suspended solids removal for the maximum expected

volume of runoff generated by a 24-hour duration 10-year frequency rainfall event (approximately 3.8 inches) (9.6 cm). Discharge from the settling basins will not exceed a suspended solids concentration of 50 mg/l, and will have a pH within the range of 6.0 to 9.0 as required by EPA Standards (40 CFR 423.45). The settling basins will have sediment removed only if they become filled to such a degree that effluent water quality will exceed the EPA Standard.

Ditches - A drainage ditch system will be constructed to intercept runoff and convey it to the settling basins. This system will be composed of both temporary and permanent ditches, conduits and channels designed to ensure a low velocity flow to minimize erosion. All permanent ditches will be seeded and then protected with hay, mulch, or fabric materials until the grass takes hold. Where anticipated flow velocities are high, the ditches and channels will be lined with crushed stone, gravel, or similar materials. In addition, where very high velocities are expected due to extreme gradient changes, check dams and/or concrete linings will be employed. Underground drainage systems (e.g., culverts, pipes) will be constructed within the plant area to be utilized as permanent installations where applicable.

Silting Fences - In areas where new construction is involved and existing topography precludes the formation of settling basins, silting fences will be provided for temporary use in controlling erosion and preventing suspended solids conveyance to water sources. Additionally, gravel filters and sediment traps will be employed.

Road Stabilization - Construction access roads and permanent roads will be surfaced with asphalt penetrated crushed stone and bituminous concrete, respectively.

Slope Stabilization - All proposed temporary or permanent slopes (cut or fill areas) will be graded and stabilized by revegetation, contour stripping, or protective rock blankets. Permanent vegetative erosion control on the site will be accomplished by the use of hardy perennial grasses, legumes, and woody plants which will be selected for their ability to establish themselves quickly and prevent erosion. Permanent plantings will take place as soon as conditions permit. Diversion ditches will be constructed at the top and toe of each slope to intercept runoff. The main plant area will be terraced, with the elevations stepping downward as the lake is approached. This will minimize cut and fill operations on the site, as well as facilitate drainage of the areas.

Dust will be controlled during dry periods by water spraying.

LIQUID WASTES

Construction Phase Liquid Waste

1.061
Liquid waste produced during the construction of the proposed station will include construction drainage, potential spills of chemicals or fuels and sanitary wastes. Runoff generated by precipitation on the site during construction will be classified as either uncontaminated or potentially contaminated. Uncontaminated runoff will be produced by rainfall on those portions of the site unaffected by construction and will be typical of natural runoff. Potentially contaminated runoff will be produced by precipitation on areas with a disturbed earth surface. Runoff in this potentially contaminated category may occasionally exhibit high suspended solids concentrations. The total volume of potentially contaminated runoff expected from a 24-hour duration/10-year frequency storm will be approximately 10.8 million gallons (40.9 million liters) at the Somerset Site. This wastewater will be directed to settling basins for the removal of suspended solids to meet effluent limitations (50 mg/l of total suspended solids), and will ultimately be discharged to Lake Ontario. Effluent from excavation dewatering will be treated as necessary to achieve standards for solids, pH, oil, and grease.

Possible contamination of the lake by spills of chemicals or fuel will be eliminated by proper control measures. Lubricants, oil, and chemicals will be stored in designated storage areas. These storage areas will be sealed with impermeable liners and designed to contain and hold any potential spills until manual removal can be effected. These storage areas will be designed to contain runoff from the 10-year, 24-hour storm.

Construction Runoff Settling Basins

1.062
Potentially contaminated runoff generated during construction of the proposed station will flow to a number of permanent and temporary settling basins for the removal of suspended solids. These basins will be constructed and designed to hold the anticipated volume of runoff generated by a 24-hour/10-year rainfall event. Four of these basins will be permanent structures to be utilized as components of the station's liquid waste treatment system following the construction period. The remaining basins will be formed by diking natural drainage canyons or by digging inground earthen structures. Following the construction period, the temporary basins will be filled in and seeded to restore their sites to their original condition. Basin effluent, which will have a pH within the range of six to nine , will not exceed 50 mg/l of suspended solids as required by

effluent standards. Figure 1-9 depicts the location of the settling basins and the directions of drainage flow. Table 1-8 presents a description of the effluent receiving watercourse of each basin. Design flows and basin dimensions are given in Table 1-9.

TABLE 1-8

RECEIVING WATERCOURSE DESCRIPTION

Discharge Number	Receiving Watercourse	Water Index[1] Number	Water[2] Classification
001	Intermittent stream	None	D
002	Intermittent stream	None	D
003	Intermittent stream	None	D
004	Intermittent stream	None	D
005	Lake Ontario	Lake Ontario (Item No. 4)	A
006	Lake Ontario	Lake Ontario (Item No. 4)	A
007	Intermittent stream	None	D

[1] 6 NYCRR ARTICLE 9, Part 847.
[2] Water Classification corresponds to classifications and standards of 6 NYCRR, Parts 700-704.

Construction Period Sanitary Wastes

1.063
The size of the construction force will build up over the construction period to a peak level of approximately 1,370 persons. Initially, chemical toilets will be used until a sewerage system is installed during the first phase of construction. This system will collect wastes from the temporary office, wash house, and toilet areas for conveyance to a packaged sewage treatment system. Throughout the construction phase, chemical toilets will remain in use at the construction areas which are not proximate to the main plant complex. The final disposal of wastes from these chemical toilets will be accomplished by a contractor in compliance with

TABLE 1-9

DESIGN FLOWS

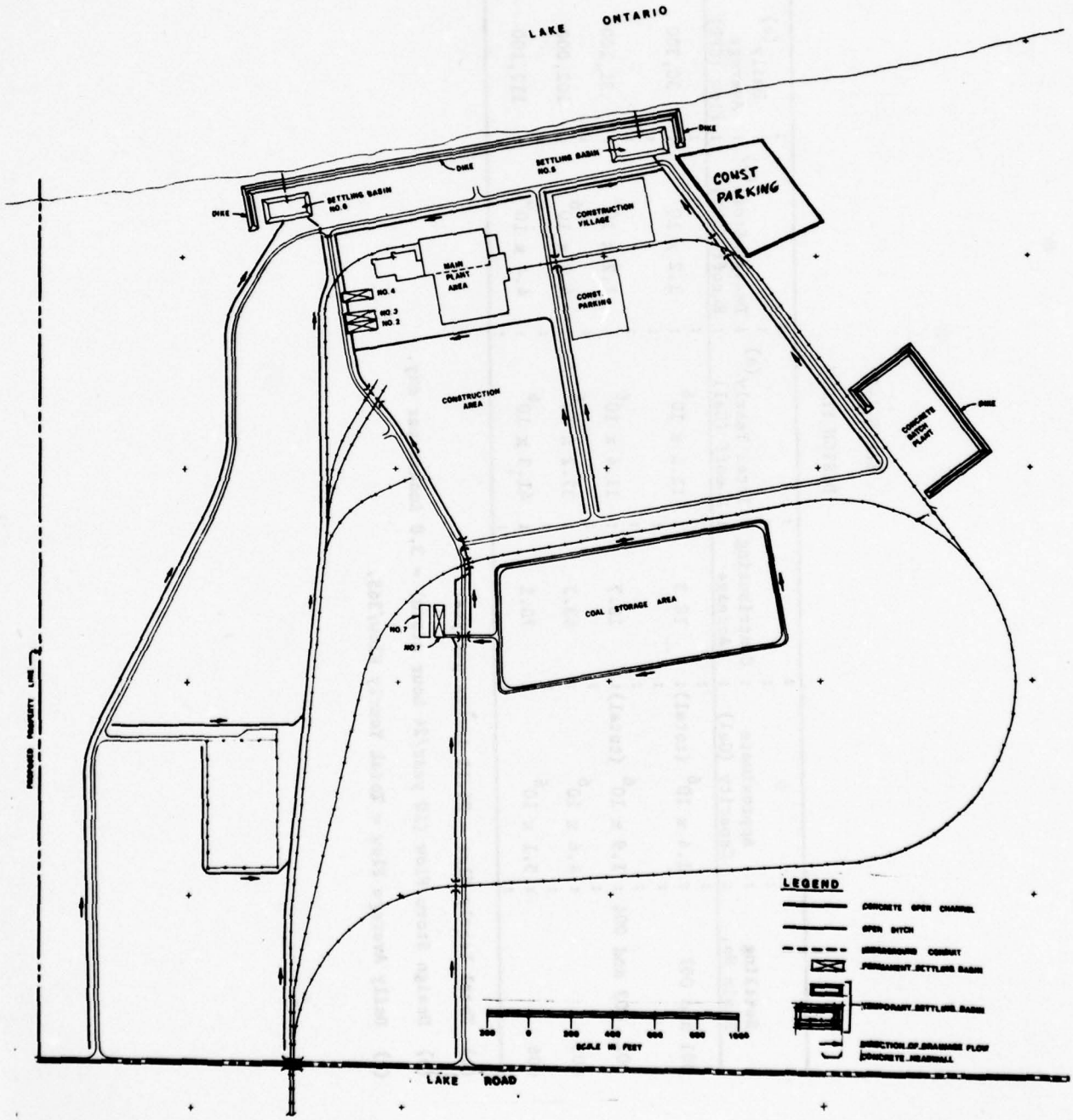
Settling Basin No.	Approximate Capacity (Gal)	Contributing Acreage	Total Yearly[(a)] Runoff (Gal)	Design Storm[(b)] Runoff (GPD)	Daily[(c)] Average Flow (GPD)	Dimensions (L x W x D)
001 and 007	1.4×10^6 (total)	18.3	11.1×10^6	1.2×10^6	30,300	150' x 48' x 12'
002, 003 and 004	1.9×10^6 (total)	18.7	11.4×10^6	1.2×10^6	31,100	150' x 62' x 12' 150' x 48' x 12' (ea)
005	4.6×10^6	63.3	37.2×10^6	4.0×10^6	102,000	325' x 135' x 14'
006	5.1×10^6	70.2	41.3×10^6	4.4×10^6	113,100	360' x 144' x 14'

(a) Total Yearly Flow = 36.11 inches per year.

(b) Design Storm Flow (10 year/24 hour storm) = 3.8 inches per day.

(c) Daily Average Flow = Total Yearly Flow/365.

FIGURE 1-9 CONSTRUCTION DRAINAGE



existing Federal and State regulations. During the peak level of construction, 22,000 gpd, (83,270 liters per day) of sanitary wastes will be generated, resulting in a raw waste daily average BOD_5 loading of 60 pounds (27.21 kg) per day. Sanitary waste characteristics prior to treatment are presented in Table 1-10. The wastes will be directed to the treatment unit which will be designed to meet Federal criteria (40 CFR 133) and New York State requirements. An extended aeration process will be employed to provide 85 to 95 percent removal of BOD_5 and suspended solids, and complete removal of floating and settleable solids. The effluent will be chlorinated prior to discharge to the lake. Effluent characteristics are presented in Table 1-11.

Operational Phase Liquid Waste

1.064
The following discussion presents a description, collection method, storage, treatment and disposal process for each liquid waste stream generated by the operation of the proposed station.

Sanitary Waste

1.065
The plant sewerage system will collect wastes from all sanitary facilities as toilets, sinks, showers, and similar sources. The average daily volume of waste from these sources will be approximately 4,200 gallons (15,746 liters). The raw wastewater will be slightly more concentrated than typical domestic sewage, with five-day biochemical oxygen demand (BOD_5) and suspended solids concentrations of approximately 300 and 250 mg/l, respectively. The total phosphorus (as P) and total nitrogen (as N) concentrations in the raw wastewater will be about 10 to 40 mg/l, respectively.

1.066
A factory-built extended aeration treatment plant will be provided to treat sanitary wastes generated by the station's normal operating work force of 112 people. Approximately 4,160 to 4,800 gallons (15,746 to 18,168 liters) of wastewater will be produced each day with a BOD_5 loading of eight to 11.2 pounds (3.2 to 4.8 kilograms) per day. The plant will be of welded steel construction divided into two major sections (an aeration and a clarifier compartment). The principal components of the unit will include: a screening basket, aeration equipment, an automatic hydraulic skimming system, and a chlorine contact tank. Treated sanitary waste effluent, which will be discharged directly to the cooling water, will meet the effluent limitations required by 40 CFR 133. The treatment plant will provide at least 85 percent removal of BOD_5 and suspended solids with the average concentrations of these paramters not exceeding 30 mg/l.

TABLE 1-10

PREDICTED CONSTRUCTION WASTES

Waste Type	Description	Frequency[a]				Volume (million gallons)				Primary Waste Constituent	Concentration (mg/l)				Weight (thousand pounds)			
		Collection	Treatment	Transportation	Disposal	Yearly Max.	Yearly Avg.	Monthly Max.	Monthly Avg.		Yearly Max.	Yearly Avg.	Monthly Max.	Monthly Avg.	Yearly Max.	Yearly Avg.	Monthly Max.	Monthly Avg.
Sanitary waste	Liquid waste from toilets, sinks, etc.	C	C	N	C	5.5[d]	2.3[d]	0.4[d]	0.2[d]	Nitrogen	85	40	85	40	1.8	0.7	0.14	0.16
										Phosphorus	20	10	20	10	0.5	0.2	0.04	0.22
										BOD	480	400	480	400	18.2	7.5	1.4	0.06
										SS	400	320	400	320	14.5	6.0	1.1	0.6
Construction drainage	Contaminated runoff	P	P	N	P	101[f]	101[f]	10.8[f]	8.4[f]	SS	Highly variable dependent on precipitation characteristics[c]							
Construction refuse	Solid waste from construction processes	C	N	(e)	(e)						Not applicable							
Spills	Gasoline, oil and miscellaneous construction liquids	E	E	E	E						Not applicable							

a. Key: C, continuous; N, none; P, precipitation dependent; E, emergency.
b. Refers to discharge manner for liquid wastes.
c. Potentially contaminated construction runoff will be treated prior to discharge in accordance with EPA requirements (40 CFR 423.45).
d. Maximum volumes of sanitary wastes are based on construction force of 1400 persons during peak construction year. Average volumes estimated are based on an average workforce of 580 persons for the remaining three years. Volumes and weights are based on a 5-day work week.
e. When quantities justify.
f. Volume of construction runoff based upon approximately 36 inches of rain per year. Monthly average is 1/12 of the yearly volume; monthly maximum is the occurrence of a single 10 year 24-hour design storm (3.8 in. precipitation).

TABLE 1-11

PREDICTED CONSTRUCTION DISCHARGE CHARACTERISTICS[a]

Discharge	Quantity (lb/mo) Maximum	Quantity (lb/mo) Average	Concentration (mg/liter)[b] Range
Sanitary Facility[c]			
Floating & Settleable Solids	0	0	0
Suspended Solids	110	44	30 to 45
Phosphorous (Total as P)	37	14	8 to 10
Nitrogen (Total as N)	147	58	28 to 40
BOD_5	110	44	30 to 45
Fecal Coliform Bacteria	NA	NA	Geometric mean less than or equal to 200 per 100 ml
Chlorine[d]	1.9	0.7	0.5
pH	NA	NA	6 to 9
Construction Yard Drainage System			
(i) Uncontaminated[e]	--	--	--
(ii) Potentially Contaminated			
Suspended Solids	--	--	0 to 50
pH	NA	NA	6 to 9

a. Except for fecal coliform bacteria and pH.

b. The Sanitary Facility will provide the following removal efficiencies:

Floating & Settleable Solids	100 percent
Suspended Solids	85 to 95 percent
BOD_5	85 to 95 percent
Phosphorous	0 to 20 percent
Nitrogen	0 to 30 percent

The maximum quantity of treated effluent will be discharged during the peak construction year, 1981 (flow rate = 22,000 gpd). Average quantities are for the years 1979, 1980, and 1982 (flow rate 8,700 gpd average). The discharge will be in conformance with Federal (40 CFS 133) requirements.

c. A controlled chlorine concentration of 0.5 mg/liter as Cl_2 will be maintained in the discharge for disinfection purposes.

d. Uncontaminated yard drainage will exhibit characteristics similar to natural runoff except that gross solids (e.g., leaves and twigs) will be removed via catch basins prior to discharge.

Proper disinfection of the effluent will be accomplished in the chlorine contact tank. Wash and drain wastes associated with the FGD system will be returned to the scrubber, consistent with the closed-loop system operation.

Chemical Cleaning Operations

1.067
Routine maintenance washes will be performed throughout the life of the generating facility. These procedures will include chemical cleaning of the boiler and washing of the air heater, stack, and precipitator. These washes may produce a maximum of six million gallons (23 million liters) of wastewater each year. The average will be less, as not all wash procedures are conducted on a yearly basis. Cleaning of the boiler tubes by utilization of chemical solvents, such as diluted hydrochloric acid, is expected to be necessary once every two to four years. The boiler chemical cleaning wastewater will contain high total dissolved solids concentrations (50,000 to 60,000 mg/l) during acid displacement.

1.068
Wastewater generated from the other washing procedures will contain substantially lower total dissolved solids concentrations. In general, wastewater resulting from routine maintenance washes will contain about 1000 mg/l of suspended solids and will have a pH ranging from 1 to 13. The waste generated from the stack, the air heater, and the precipitator washes will contain coal ash residues. These wastes will actually be produced only 15 to 20 days per year and will be directed to the station's liquid waste treatment system (Table 1-12).

Yard Drainage from Potentially Contaminated Areas

1.069
Precipitation runoff from the precipitator ash handling, coal and limestone handling, and fuel oil storage areas may be contaminated by leakages and spills. The quantity and quality of this runoff will vary greatly. Suspended solids and dissolved solids concentrations may be as high as 1000 and 500 mg/l, respectively. In addition, oil may be present in the runoff from the fuel oil storage areas. The fuel storage areas will be lined with an impermeable material.

The average annual runoff from these potentially contaminated areas will be approximately 2.3 million gallons (8.7 million liters), or about 6,300 gpd (23,846 liters per day). A 10-year frequency storm of 24-hour duration could generate approximately 250,000 gallons (946,250 liters) of runoff from these areas. Runoff will be directed to the liquid waste treatment system.

TABLE 1-12

PREDICTED MAINTENANCE WASTES

Waste Type	Description	Frequency: Collection	Frequency: Treatment	Frequency: Transportation	Frequency: Disposal	Annual Volume[a] (million gallons): Max.	Annual Volume[a] (million gallons): Avg.	Primary Waste Constituent	Annual Concentration[a] (mg/l)[b]: Max.	Annual Concentration[a] (mg/l)[b]: Avg.	Annual Weight[a] (thousand pounds): Max.	Annual Weight[a] (thousand pounds): Avg.
Preoperational cleaning	Chemical wash and rinse from boiler	Once during lifetime of facility					2.9	TDS	6000	5000	145	121
								SS	1000	800	24.2	19
								pH	1-13	1-13		
	Pre-boiler cleaning	Once during lifetime of facility					4.3	TDS	6000	5000	215.2	180
								SS	1000	800	35.8	28
								pH	1-13	1-13		
Routine washes	Boiler wash	Biannual				1.5	1.2	TDS	6000	5000	75.1	62.6
								SS	1000	800	48	37
	Air heater wash	Two per year				3.4	3.0	pH	1-13	1-13		
								Fe[c]			7	4
	Stack wash	Two per year				0.15	0.11	Zn[c]			0.6	0.5
								Ni[c]			0.25	0.2
								Cu[c]			0.25	0.2
	Precipitator wash	Two per year				0.3	0.24					
	Boiler Fireside wash	One per year				0.6	0.45					

a. Maintenance wastes are generated periodically, as indicated, making monthly volumes, weights, and concentrations irrelevant as means of expressing waste characteristics.

b. Except for pH.

c. Corrosion products removed during boiler wash. Concentrations will vary greatly depending on extent of dilution during rinse.

1.070
With the exception of ash handling, electrostatic precipitation, and coal car unloading area runoff, which will be directed to the Coal Pile Drainage Treatment System, precipitation runoff from yard areas subject to possible contamination from coal and limestone fines, ash spillage, oil, and other pollutants will be directed to a 500,000 gallon (1,892,500 liters) settling basin. In addition, building floor and equipment drainage (five to 150 gpm) (19 to 568 liters per minute) will flow to this settling basin for suspended solids removal. Effluent from the basin will flow at a controlled rate (maximum 200 gpm), (757 liters per minute) to a corrugated plate oil separator. Chemical feed equipment will be initiated to aid in breaking oil/water emulsions whenever they are present in the wastewater. Final pH correction, if required, will be accomplished in a flow-through neutralizer prior to the wastewater entering the station's treated effluent storage tank.

Ash and FGD Sludge Handling Systems

1.071
The proposed station will utilize a closed bottom ash sluice system. Bottom ash will be conveyed from the furnace to a series of settling tanks from which the ash will be removed to the station's solid waste disposal area. Supernatant from the settling tanks will be recycled to the furnace for further ash sluicing. Approximately 35 gpm (132 liters per minute) of makeup water, which will be either lake water or treated waste effluent, will be required for the system to replenish water lost with the ash.

Fly ash will be collected dry and pneumatically conveyed to storage silos, thus eliminating the generation of wastewater. Normally, fly ash will be pneumatically conveyed in a dry form to the FGD sludge stabilization system. Fly ash not used in this manner will be loaded onto trucks via a dustless unloader. The dustless unloader will require approximately 65 gpm (246 liters per minute) during unloading operations.

FGD sludge will be pumped to the FGD sludge stabilization building where it will be dewatered, mixed with fly ash and a stabilization additive. The stabilized sludge will be stockpiled adjacent to the building. Supernatant from the dewatering process will be recycled to the FGD system. Thus, no wastewater will be produced.

Building Floor and Equipment Drainage

1.072
Certain floor drains, during equipment cleaning and repair operations, and certain equipment drains, because of seal or equipment

failures, will at times pick up oily wastes. The routine flow from these drains is expected to contain oil concentrations of 0 to 100 mg/l and suspended solids concentrations averaging 30 mg/l. The drainage flow rate will range from five to 150 gpm (19 to 568 liters per minute) with an average of 50 gpm (189 liters per minute). This wastewater will be directed to the liquid waste treatment system. Settling basins used in this treatment system will be sealed with an impermeable liner.

Water Treatment Wastes

1.073
Water used in the station for boiler makeup, general service, and potable uses will be treated to attain the required quality. Essentially, the equipment will consist of activated carbon filters followed by a demineralizer system. Condensate polishers will provide an additional means of maintaining boiler water quality. Each of the two activated carbon filters will be backwashed an average of once per week to remove accumulated suspended material. The total quantity of water required to backwash the filters will average 8,000 gallons (30,280 liters) per week. The resulting wastewater will normally contain suspended solids concentrations of about 225 mg/l.

1.074
The demineralizers will be regenerated in two separate cycles. One of the two trains of primary ion exchange vessels (weak acid cation, strong acid cation, and weak base anion vessels) will normally be regenerated once per day. This regeneration will produce approximately 20,000 gpd (75,700 liters per day) of wastes consisting of spent acid rinse waters (pH 1 to 4) and spent caustic rinse waters (pH 7 to 13) with a total dissolved solids concentration of about 6,000 mg/l and essentially no suspended solids. The secondary ion exchange vessels (two mixed-bed vessels) will be regenerated on an average on one vessel per week. Approximately 6,000 gallons (22,701 liters) of spent acid rinse water and caustic rinse water will be produced during the regeneration of one mixed bed vessel. This wastewater will be similar to the regeneration wastes from the primary ion exchange vessels.

1.075
Each of the four condensate polishing demineralizers will be regenerated approximately once per month. Each regeneration will result in about 60,000 gallons (227,100 liters) of spent acid and caustic rinse water. The total dissolved solids concentration of the regenerant wastes is expected to average 1250 mg/l. All water treatment wastes will be directed to the liquid waste treatment system ("Batch Neutralization Facilities" and "Low Conductivity Waste Reclamation System").

Material Storage Pile Runoff

1.076
Precipitation on the station's coal pile will result in surface runoff and infiltration. This runoff/infiltration will leach varying amounts of soluble materials from the coal as well as flush out coal fines. The chemical composition of the coal pile runoff will be variable and will fluctuate with the intensity of rainfall and resultant coal/ runoff contact time. The specific sulfur content of the coal will greatly influence the chemical makeup of the runoff. Two to three percent sulfur coal will typically produce runoff with a pH of 2 to 3, and average dissolved and suspended solids concentrations of 3000 and 500 mg/l, respectively. The average annual coal pile runoff will be approximately 14 million gallons (53 million liters), (39,000 gpd) (7,615 liters per day). A 10-year frequency storm of 24-hour duration (3.8 inches of precipitation) (9.7 centimeters) can be expected to result in the generation of 1.4 million gallons (5.3 million liters) of coal pile runoff (assuming a 0.85 runoff coefficient). The runoff will be directed to the liquid waste treatment system. Limestone pile and stabilized sludge stockpile runoff will be approximately 7,000 gpd (average). The runoff will be high in suspended solids. The runoff will be directed to the liquid waste treatment system.

Disposal Area Runoff

1.077
Rainfall runoff from the solid waste disposal area will be alkaline in nature and high in hardness and will contain traces of metals. Ash and FGD sludge will be deposited in a three-phase sequence which is described in this chapter under the heading "solid wastes." Based on a runoff coefficient of 0.75 and average fill surface area over the 30-year plant life, the long-term average runoff quantity will be 248,000 gpd. The runoff from disturbed areas of the disposal site will be directed to sedimentation ponds for treatment. These ponds are shown in Figure 1-3. Water quality will be monitored at the drop inlet of each pond.

Batch Neutralization Facilities

1.078
High conductivity wastes, generated during the chemical regeneration of the water treatment demineralizers and the condensate polishers, will be treated in a batch neutralization system. In addition, spillage and leakage collected by the floor drainage system associated with the chemical feed and storage areas will consist of batch neutralization tank, a high conductivity waste holding tank, a pH analyzer/controller, and acid and caustic chemical feed equipment.

The neutralizer tank will have a capacity of 35,000 gallons (132,475 liters) which is the anticipated total minimum daily volume of high conductivity wastes resulting from the regeneration of one primary train of water treatment demineralizers, one unit of the secondary ion exchange vessels, and one vessel of the condensate polishing system. A 35,000 gallon (132,475 liters) high conductivity waste holding tank will be provided to receive wastewater whenever the batch neutralization tank is in operation. Upon initiation of the neutralization process, the neutralization tank contents will undergo a timed mixing cycle to ensure a homogenous waste. After this initial mix period, a pH analyzer/controller will actuate the appropriate metering pump to inject either acid or caustic as needed to bring the wastewater to within the required pH range of 6.0 to 9.0. Effluent with acceptable pH levels will be drained to the station's treated effluent storage tank for inplant reuse and/or discharge to the circulating cooling water.

Low Conductivity Waste Reclamation System

1.079
Wastewater resulting from the regeneration of water treatment and condensate polishing demineralizers will be segregated into low conductivity and high conductivity portions. The low conductivity waste reclamation system will provide the capability to hold and subsequently treat by filtration and demineralization the low conductivity portion of the regenerant wastes. In addition, it is anticipated that boiler blowdown will exhibit low conductivity characteristics and, thus, will be directed to this system. A 50,000 gallon (189,250 liters) holding tank will provide containment for the maximum volume of low conductivity wastes resulting from the regeneration of one train of water treatment demineralizers, and one vessel of the condensate polishing system. Additionally, the holding tank will be capable of receiving typical daily blowdown volumes. When a sufficient volume of water is present within the low conductivity waste holding tank, the contents will be pumped through a disposable type cartridge filter to the influent header of the water treatment system mixed-bed vessels. Effluent from the mixed-bed demineralizers will be suitable for reuse as boiler feedwater.

Material Storage Pile Runoff

1.080
Three 500,000 gallon (1,892,500 liters) settling basins will receive material storage pile runoff(coal pile, limestone pile, and stabilized sludge stockpile). The basins will be used to reduce influent suspended solids concentrations and to suppress hydraulic surges into downstream treatment processes. Runoff from the material storage pile, which will be placed on a hard, impervious surface and

surrounded by a dike, will be collected in a depression along the dike and drained to the three basins. The 1.5 million gallon (5,678,117 liters) capacity of the three settling basins will provide runoff storage for all but the worst storms. Runoff in excess of this capacity can be stored within the diked area of the coal pile prior to treatment. In this manner, all coal pile runoff will be contained and treated at a controlled flowrate. Effluent from the basins will flow to physical/chemical treatment facilities at a maximum design flowrate of 500 gpm (1,893 liters). The settling basins and coal car unloading area will be scaled with an impervious liner.

Physical/Chemical Treatment Facilities

The physical/chemical treatment facilities will consist of a lime reaction tank (and associated lime storage and feed equipment), an oxidation tank, and clarifier/thickeners. The function of these facilities will be to raise the pH of the wastewaters to a range of eight to nine by the addition of a slurry of hydrated lime for the purpose of precipitating certain dissolved solids and to remove these precipitated solids and suspended solids from the wastewater. Aeration in the oxidation tank will aid in the chemical reactions causing precipitation. Two circular clarifier/thickeners, each designed to receive effluent wastewater from the oxidation tank at a maximum flowrate of 250 gpm (946 liters per minute) will effect liquid/solids phase separation resulting in an effluent low in suspended solids.

1.081
Clarifier/thickener underflow, having a one to three percent solids concentration by weight, will be directed to a sludge storage thickener. The function of this unit will be to provide a thickened sludge, consisting of five to eight percent solids by weight, which will subsequently be transported to a disposal site or used in the wetting of fly ash prior to disposal. A discussion of sludges produced by the liquid waste treatment system is presented in the following section. Overflow from the clarifier/thickeners will be directed to a battery of dual media gravity filters. Filtration to remove suspended solids and turbidity from the wastewaters will be performed to ensure a final effluent which will contain less than 30 mg/l of suspended solids. Backwash wastes from these filters, as well as backwash wastes from the water treatment system activated carbon filters, will be directed to the clarifier/thickeners for treatment.

Maintenance Waste Treatment

1.082
Wastewater generated during plant startup procedures and scheduled

maintenance cleaning of the stack, boiler tubes, boiler fireside, air preheaters, and electrostatic precipitators will be directed to the settling basins utilized in the treatment of material pile runoff and contaminated yard and building drainage. These liquid wastes will exhibit extremes of pH and will contain both high suspended and dissolved solids concentrations.

Unit operations for the treatment of these wastes will be essentially identical to those used in the treatment of material storage pile runoff. After equalization and settling, the wastewater will flow to a lime reactor system where the pH will be raised to about 9.0. Aeration in the oxidation tank will be employed to reduce dissolved solids concentrations by precipitating metal hydroxides. Flocculation, clarification, and filtration will follow. If iron and copper are present in these wastewaters, they will not exceed 1.0 mg/l in the effluent as required by effluent limitations. Final pH adjustment will be accomplished in the flow-through neutralizer, if necessary. Maintenance wastewaters related to the FGD system will be contained in an FGD system thickener, or hold tank. This waste will be recycled to the scrubbers during operation and thus no wastewater is anticipated to be released.

Flow-Through Neutralization Facilities

1.083
Gravity filter effluent (material storage pile runoff or maintenance wastes), as well as effluent from the contaminated yard and building drainage treatment system, will be directed to a flow-through neutralizer. This unit will adjust the wastewater pH, if necessary, to within a range of 6.0 to 9.0 in accordance with discharge limitations. A pH analyzer/controller will control metering pumps which will inject either acid or caustic into the neutralization tank in response to the pH of the influent wastewater. This tank will provide a minimum detention time of five minutes at the maximum influent waste flow. Effluent from this unit will be directed to the station's treated effluent storage tank prior to inplant reuse and/or discharge.

Treated Effluent Storage Tank

1.084
With the exception of treated sanitary wastes, all station treated wastewater will be directed into a storage tank. This tank will store treated effluent from the liquid waste treatment system so that it can be reused for various station operations. These include coal dust suppression, fly ash dustless unloading, FGD system makeup, and makeup to the bottom ash handling system. The estimated daily water

use for these operations is greater than the average nonprecipitation related waste flow generated by routine station operation; thus no discharge is normally expected. Treated wastes in excess of the volume capable of being utilized will be discharged to the circulating cooling water after meeting applicable effluent standards. Table 1-13 presents predicted routine operation and maintenance discharge characteristics of all liquid wastes prior to combination with the cooling water discharge.

Ash and Stabilized Sludge Runoff

1.085
The solid waste landfill at the site will be developed in controlled phases and sequences which will limit the area under active development. The base of the fill being developed will be sloped to promote drainage of fill runoff material to a lined ditch surrounding the area and eventually to sedimentation ponds. The sequencing will be accomplished in three phases. Fill operation will commence in Phase I at the northeast corner of the site. A lined sedimentation pond will be constructed at the same time as a berm adjacent to the fill. This berm will contain potentially contaminated runoff within the fill area, and direct it to the pond. Additionally, the berm will provide visual screening during the initial stages of the fill operation. A lined cutoff ditch will be constructed around the perimeter of the fill area to divert uncontaminated runoff away from the fill. Phases II and III will be developed in a similar manner. The active acreage of exposed waste will range from six acres to 14 acres with an initial commitment in Phase I of 17 acres. Four sedimentation ponds will ultimately be provided to treat the runoff from the disposal fill areas. Two sedimentation ponds of 2.3 and 0.3 acres will be required, upon start-up, to handle runoff from the Phase I waste disposal site and the pyrites disposal site, respectively. Phase II and III waste disposal areas will require, upon start-up, sedimentation ponds of 1.3 and 3.3 acres, respectively. The disposal areas and ponds are shown in Figure 1-3.

1.086
Treatment of runoff and subdrainage diverted to the sedimentation ponds will be in conformance with the Federal Effluent Guidelines and Standards for the Steam Electric Power Point Source Category (40 CFR 423). The limitations for runoff discharges from material storage areas (which specifically includes ash disposal areas) are a suspended solids concentration not to exceed 50 mg/l and a pH within a range of 6.0 to 9.0. These limitations are applicable to systems designed, constructed, and operated to treat the runoff volume resulting from a once in 10 years, 24-hour rainfall event. Runoff for storms in excess of the 10-year, 24-hour volume is not subject to these limitations. The water will also be monitored for the presence

TABLE 1-13

PREDICTED ROUTINE OPERATION AND MAINTENANCE DISCHARGE CHARACTERISTICS PRIOR TO COMBINATION WITH COOLING WATER DISCHARGE[a]

Discharge	Quantity (lb/mo) Maximum	Quantity (lb/mo) Average	Concentration (mg/liter)[b] Range
Sanitary Facility[c]			
Floating & Settleable Solids	0	0	0
Suspended Solids	36.0	31.5	30 to 45
Phosphorous (Total as P)	12.0	10.6	8 to 10
Nitrogen (Total as N)	48.0	41.9	28 to 40
BOD_5	36.0	31.5	30 to 45
Fecal Coliform Bacteria	NA	NA	Geometric mean less than or equal to 200 per 100 ml
Chlorine[d]	0.61	0.53	0.5
pH	NA	NA	6 to 9
Roof and Yard Drainage System[e] (Uncontaminated Areas)	--	--	--
Treated Generating Facility[f] Waste			
	Maximum	Average	Maximum / Average
Calcium (Ca)	15,959	4,788	176 / 101
Magnesium (Mg)	2,460	2,242	27 / 47
Sodium (Na)	13,984	3,850	154 / 81
Potassium (K)	1,592	106	18 / 2.2
Hydroxide (OH)[i]	0	0	0 / 0
Carbonate (CO_3)[i]	0	0	0 / 0
Bicarbonate (HCO_3)	10,721	4,904	119 / 103
Sulfate (SO_4)[g]	51,158	29,946	564 / 524
Chloride (Cl)	42,560	1,822	469 / 38
Nitrogen (Total as N)[h]	192	213	2 / 5
Phosphorous (Total as P)	4.71	0.2	0.05 / 0.04
Total Hardness (as $CaCO_3$)	50,034	21,207	551 / 446
Total Alkalinity (as $CaCO_3$)	8,788	4,021	98 / 85
Silica (Total as SiO_2)	150	85	1.7 / 1.8
Iron (Fe)	69	48	0.8 / 1
Aluminum (Al)	54	27	0.6 / 0.6
Chromium (Total)	22.1	0.47	0.24 / 0.01

TABLE 1-13

PREDICTED ROUTINE OPERATION AND MAINTENANCE
DISCHARGE CHARACTERISTICS PRIOR TO COMBINATION
WITH COOLING WATER DISCHARGE[a]
(Cont'd)

	Maximum	Average	Maximum	Average
Nickel (Ni)	5.42	1.2	.006	0.03
Zinc (Zn)	9.42	2.1	0.10	0.04
Manganese (Mn)	2.62	2.1	0.03	0.04
Cadmium (Cd)	1.11	-	0.01	-
Sulfide (S)	2.62	-	0.03	-
Lead (Pb)	5.44	2.3	0.06	0.05
Copper (Cu)	9.42	0.3	0.10	0.006
Tin (Sn)	2.62	-	0.03	-
Mercury (Hg)	0.11	0.03	0.001	0.0006
BOD	34	25.2	0.4	0.5
COD	1,263	371	14	7.8
Oil and Grease	14	9.4	0.2	0.2
Suspended Solids	675	361	8	7.6
pH	NA	NA	6 to 9	6 to 9

a. The discharge characteristics tabulated include the contribution of the various parameters initially present in the lake water. The discharge estimates are based on using Lake Ontario water for plant operation.

b. Except for pH and fecal coliform bacteria.

c. The discharge will be in conformance with Federal (40 CFR 133) requirements.

d. A controlled chlorine concentration of 0.5 mg/liter as C12 will be maintained in the discharge for disinfection purposes.

e. Water collected and discharged via the roof and yard drainage system (uncontaminated areas) is a noncontaminated waste. This water will therefore be discharged directly to the lake without treatment.

f. The average quantity and composition estimates for the treated generating facility liquid waste is based on a typical operating month. The maximum quantity and concentration estimates are based on a one month period including all maintenance wash cleaning cycles using Cayuga Lake water as the raw water source. Only slight variations in the maximum values would be realized by utilizing Lake

TABLE 1-13

PREDICTED ROUTINE OPERATION AND MAINTENANCE
DISCHARGE CHARACTERISTICS PRIOR TO COMBINATION
WITH COOLING WATER DISCHARGE (Cont'd)

Ontario as the raw water source. Seldom, if ever, would all maintenance wash wastes occur during the same month; however, these estimates are provided to present a worst month condition. It is important to note that a substantial portion of the station's treated liquid wastes will be recycled for various installation usage. This table assumes that there is no recycle and, hence, it presents a worst month condition.

g. The relative high "maximum" concentration and load of chloride is due to the five percent hydrochloric acid (HCl) cleaning of the boiler tubes assumed. Boiler tube cleaning is expected to occur only once every two to five years. The "maximum" listed is therefore an infrequent occurrence.

h. The quantity and composition estimate for nitrogen is less for the "maximum" (compared to the "average" condition) because the condensate polisher will not be regenerated during this maintenance period and the associated nitrogen content of this waste stream will also not be present in the discharge.

i. No discharge of hydroxide or carbonate is expected because these substances will combine with hydrogen ions and be released as water and carbon dioxide.

of potentially toxic elements. Should concentrations of these elements exceed water quality standards, provisions will be made for further treatment. Discharge from both Phase I and pyrite sedimentation ponds will drain via lined ditches or pipelines towards the north into Lake Ontario, a class A water body. Phase II and III sedimentation ponds will discharge into Fish Creek number ONT 145, a class D water body. Runoff diverted away from the ash disposal will flow into Lake Ontario or Fish Creek, depending on the natural drainage pattern of the area.

1.087
Pyrites will be disposed of and compacted in a segregated portion of the disposal site. The runoff and subdrainage from the pyrites storage area will be drained to a basin that is completely separated from the main solid waste fill drainage system. The pyrites will be encased in layers of compacted stabilized sludge to minimize potential infiltration of water and oxygen into the pyrites fill. If data from the sampling program indicate that water in the pyrite runoff sedimentation pond overflow is not in compliance with water quality standards, provision for treatment will be made. Although the necessity of such treatment is not anticipated, the segregation procedure allows greater flexibility for possible future installation.

Summary of Water Use and Wastewaters

1.088
Tables 1-12 and 1-14 summarize the proposed station operations which will require the usage of water and the generation of wastewater. The tables present specific information concerning: (1) projected waste characteristics, volumes, concentrations, and weights, and (2) the frequency of collection, treatment, transportation, and disposal of the wastes. All liquid wastes except sanitary wastes will be directed to the liquid waste treatment system for treatment prior to in-station reuse and/or discharge to the cooling water. Sanitary wastes will be treated in the sanitary waste treatment system and then discharged to the cooling water. Figure 1-10 presents a schematic of liquid waste water flow.

SOLID WASTE

Construction Phase Solid Waste

1.089
Solid waste generated during construction will include: (a) dredged material, (b) excavation material, (c) construction refuse, (d sanitary waste sludge, (e) yard drainage system debris, (f) spill cleanup sludge, and (g) construction runoff treatment system sludge.

TABLE 1-14

PREDICTED ROUTINE OPERATING WASTES

Waste Type	Description	Frequency[a]				Volume (million gallons)				Primary Waste Constituent	Concentration (mg/l)[b]				Weight (thousand pounds)			
		Collection	Treatment	Transportation	Disposal	Yearly		Monthly			Yearly		Monthly		Yearly		Monthly	
						Max.	Avg.	Max.	Avg.		Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.
Water treatment	Filter backwash	Weekly	Weekly	N	Weekly	1.46	0.42	0.42	0.096	SS	225	225	225	225	2.16	0.72	0.18	0.06
	Makeup demineralizer regeneration	Daily	Daily	N	Daily	8.0	7.3	0.67	0.61	TDS pH	7000 6000	6000 6000	7000 6000	6000 6000	400	365	33	30
	Condensate polisher regeneration	Monthly per Vessel	Monthly per Vessel	N	Monthly per Vessel	3.4	2.88	0.29	0.24	TDS pH	1500 1-13	1250 1-13	1500 1-13	1250 1-13	42.5	30	3.5	2.5
	Clarifier sludge	Daily	Daily	Daily	Daily	0.23	0.21	0.02	0.02		Solids content ~ 1%				1.93	1.75 (Dry weight)	0.16	0.14
Chemical spills	Spills from acid and caustic storage and handling	E	E	N	E	0 to 10,000 gal. per spill					Not Applicable							
Floor & equipment drains	Oil contaminated wastes	C	C	N	C	31.5	26.3	2.6	2.2	Oil SS	5 50	2 30	5 50	2 30	1.3 13	0.5 6.6	0.11 1.1	0.04 0.5

TABLE 1-14

PREDICTED ROUTINE OPERATING WASTES
(Cont'd)

Waste Type	Description	Frequency[a]				Volume (million gallons)				Primary Waste Constituent	Concentration (mg/l)[b]				Weight (thousand pounds)			
		Collection	Treatment	Transportation	Disposal	Yearly Max.	Yearly Avg.	Monthly Max.	Monthly Avg.		Yearly Max.	Yearly Avg.	Monthly Max.	Monthly Avg.	Yearly Max.	Yearly Avg.	Monthly Max.	Monthly Avg.
Coal pile drainage[c]	Precipitation runoff from coal pile	P	P	N	P	15	14	1.3	1.2	TDS	3600	3000	3600	3000	450	350	37.5	30.0
										SO_4	1200	1000	1200	1000	150	117	12.5	9.7
										Fe	1200	1000	1200	1000	150	117	12.5	9.7
										SS	600	500	600	500	75	58	6.2	4.9
										pH	Will vary from 2 to 3							
Potentially contaminated runoff	Precipitation runoff from coal handling, and oil storage areas	P	P	N	P	2.5	2.3	0.21	0.19	TDS	1000	800	1000	800	21	15.3	1.7	1.3
										SS	500	300	500	300	10.4	5.7	0.9	0.5
										Oil	5	2	5	2	0.1	0.04	0.01	0
										pH	Will vary from 4 to 8							
Ash wastes		C	N	C	C	Refer to the section on "Soild Waste Disposal" for full discussion.												
Boiler blowdown and waste condensate	Water withdrawn from boiler water to maintain purity	C	C	N	C	16.0	15.8	1.4	1.3	TDS	20	20	20	20	2.6	2.6	0.22	0.22
										pH	9.5	9.0	9.5	9.0				
Uncontaminated roof & yard drainage	Precipitation runoff	P	N	N	P	Not applicable				(d)	Not applicable							

TABLE 1-14

PREDICTED ROUTINE OPERATING WASTES
(Cont'd)

Waste Type	Description	Frequency[a] Collection	Frequency[a] Treatment	Frequency[a] Transportation	Frequency[a] Disposal	Volume (million gallons) Yearly Max.	Volume (million gallons) Yearly Avg.	Volume (million gallons) Monthly Max.	Volume (million gallons) Monthly Avg.	Primary Constituent	Concentration (mg/l)[b] Yearly Max.	Concentration (mg/l)[b] Yearly Avg.	Concentration (mg/l)[b] Monthly Max.	Concentration (mg/l)[b] Monthly Avg.	Weight (thousand pounds) Yearly Max.	Weight (thousand pounds) Yearly Avg.	Weight (thousand pounds) Monthly Max.	Weight (thousand pounds) Monthly Avg.
Sanitary wastes	Wastewater from toilets	C	C	N	C	1.75	1.51	.144	.125	BOD	400	300	400	300	5.90	3.80	0.50	0.32
										SS	300	250	300	250	4.32	3.20	0.37	0.27

a. Key: C, continuous; N, none; P, precipitation dependent; E, emergency.
b. Except for pH.
c. All sludges and residues from the waste treatment system are discussed in Section 4.1(J) (1).
d, Values tabulated are based on high sulfur coal.
e. Similar to natural runoff from commercially developed areas.

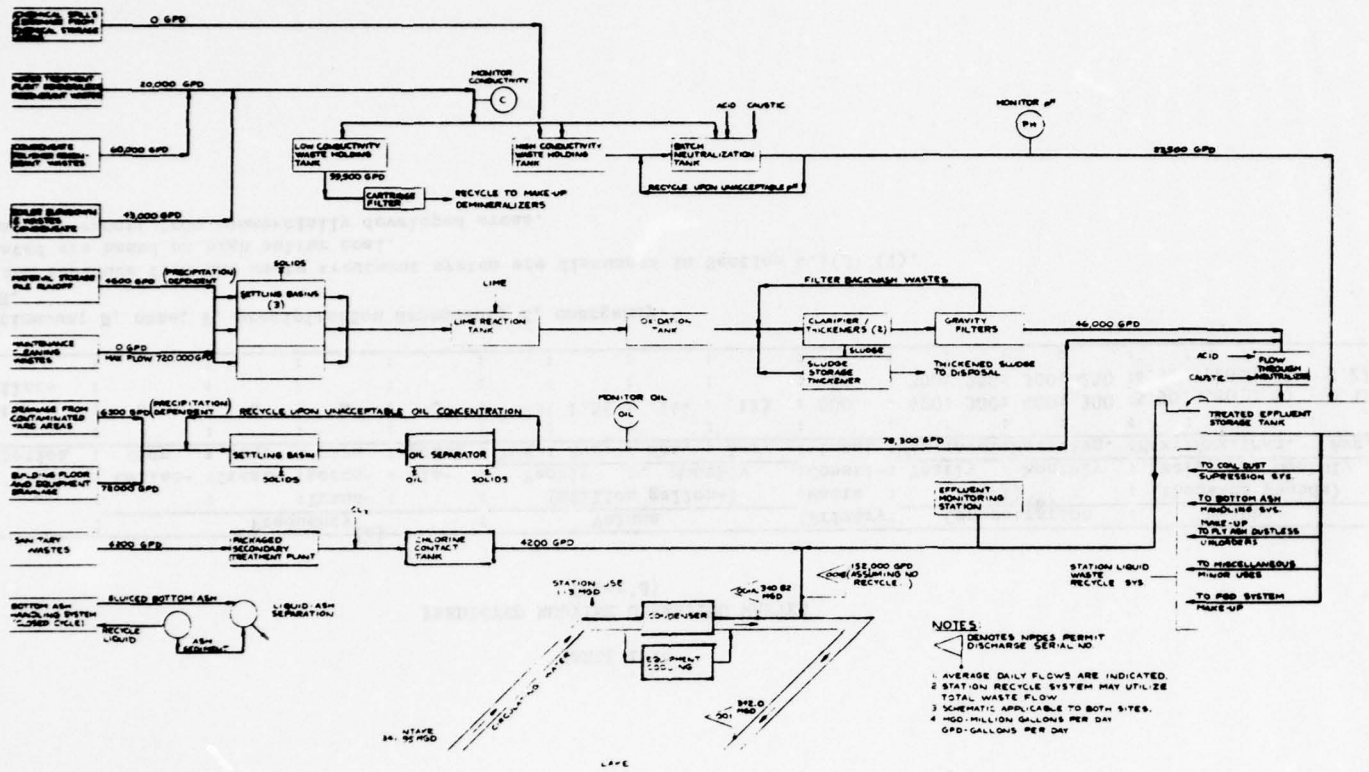


FIGURE 1–10
LIQUID WASTE TREATMENT SYSTEM
SCHEMATIC OF WATERFLOW

Expected quantities and compositions are presented in Table 1-15 for four years of construction.

Dredged Material and Excavation Wastes

1.090
Approximately 7,000 cubic yards (5,555 cubic meters) of sediments (and and silt) and 21,000 cubic yards of rock will be removed from Lake Ontario. The dredged material will be delivered from the lake to the shore by barge and from the shore to an onsite disposal area sealed with an impermeable liner. This area is shown in Figure 1-11. The disposal area for dredged material is the one which will also be used for excavated wastes. It is located approximately 800 feet shoreward of Lake Ontario, easterly of the proposed conveyor area. The spoil area will be surrounded with an earth dike and provided with its own settling pond for containment and settling of runoff. The barging ashore of material to this area will not require any special facilities for unloading since a mobile land crane will be available onshore for this purpose.

1.091
Topsoil from the construction areas will be stripped and stockpiled on site for future use. Approximately 685,000 cubic yards (524,025 cubic meters) of excavated overburden and rock will be used either as selected backfill if suitable, or as general fill. Fill areas will be terraced as required, topsoiled, and revegetated following construction.

Construction Refuse

1.092
Construction refuse includes excess recyclable and disposable materials such as paper, trees, wood, metal, rubber, masonry waste, plastics and food waste. During the four construction years (1979 through 1982), an estimated 13,000 cubic yards (9,945 cubic meters) will require disposal. Recyclable construction refuse such as lumber, metal, rubber, and paper will be separated where possible and sold for reuse or processing. Transport will be by open body truck for heavy materials and closed packer trucks for materials capable of littering during transport. Certain nonrecyclable refuse including food waste, some paper and various construction debris, will be collected in an orderly manner and transported by closed trucks to an approved land disposal area.

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FINAL ENVIRONMENTAL IMPACT STATEMENT PERMIT APPLICATION BY NEW --ETC(U)
DEC 78 A K MARKS, P G LEUCHNER, R S ROTHMAN

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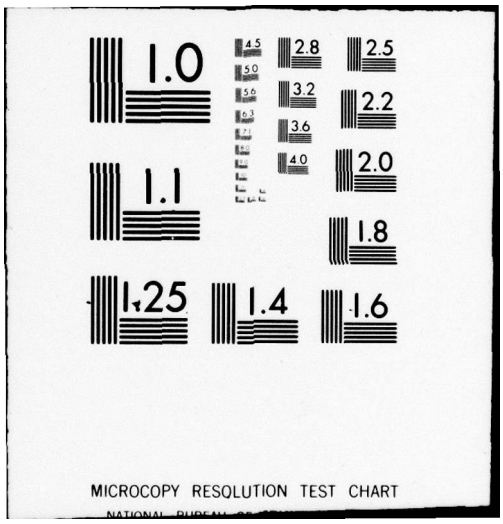

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART

TABLE 1-15

SUMMARY OF CONSTRUCTION SOLID WASTE

Solid Waste	Quantity (a)	Composition
Dredging	7,000 cubic yards	sand silt
	21,000 cubic yards	rock
Excavation	685,000 cubic yards	rock and earth
Construction refuse	13,000 cubic yards	paper, trees and vegetation, wood, metal, rubber, plastic, roofing materials, masonry waste, and food waste
Sanitary wastes	250 tons (wet)	(three percent solids) typical of domestic sludge undergoing secondary treatment
Yard drainage system debris from catchbasins	1 ton (dry)	leaves, twigs, and small construction debris
Spill cleanup	negligible	chemical or oil
Construction runoff water treatment system sludge	(b)	settleable material, silt, grit

a. Quantities are based on four years of construction.
b. Quantities are directly precipitation dependent.

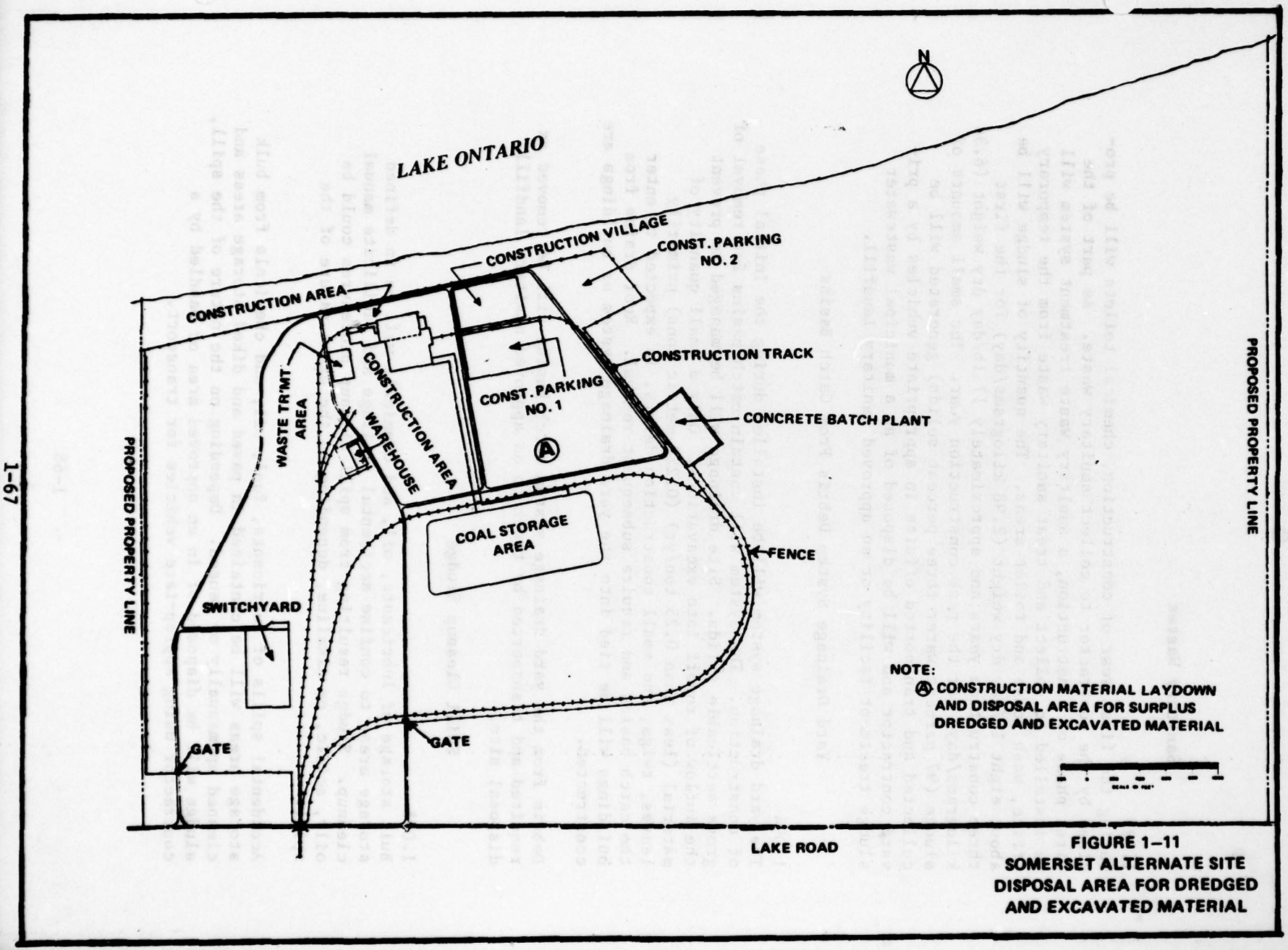


FIGURE 1–11
SOMERSET ALTERNATE SITE
DISPOSAL AREA FOR DREDGED
AND EXCAVATED MATERIAL

Sanitary Wastes

1.093
During the first year of construction, chemical toilets will be provided by the contractor to collect sanitary waste. As part of the first phase of construction, a sanitary waste treatment system will be installed to collect and treat sanitary waste from the temporary office, wash house and toilet areas. The quantity of sludge will be about eight lb/day dry weight (2.98 kilograms/day) for the first three construction years and approximately 17 lb/day dry weight (6.34 kilograms/day) for the peak construction year. The small amounts of sludge (97 percent water three percent solids) generated will be collected and transported offsite in appropriate vehicles by a private contractor and will be disposed of at a municipal wastewater sludge treatment facility or an approved sanitary landfill.

Yard Drainage System Debris From Catch Basins

1.094
The yard drainage system will be installed during the initial phase of construction. The system will contain catch basins for removal of gross settleable solids. Site drainage will be managed to prevent the inflow of runoff into excavations. Only a small quantity of material (less than 0.25 ton/yr) (0.227 metric tons) primarily leaves, twigs, and small construction debris, is expected to enter the catch basins and require subsequent removal. Roof drains from buildings will be tied into the yard drainage system as buildings are constructed.

Debris from the yard drainage system catch basins will be removed as required and transported by truck to an approved sanitary landfill disposal site.

Spill Cleanup Sludge

1.095
Bulk storage of lubricants, oil, and chemicals will be in defined storage areas to confine accidental spillage and facilitate manual cleanup. Sludge resulting from spill cleanup procedures could be oily, acidic, or alkaline, depending on the exact nature of the spill.

Accidental spills of lubricants, fuel, oil, and chemicals from bulk storage areas will be contained in paved and diked storage areas and cleaned up manually or reused. Depending on the nature of the spill, sludge will be disposed of in an approved area or handled by a contractor using appropriate vehicles for transport.

Construction Runoff Treatment System Sludge

1.096
Construction wastewater and drainage which may be contaminated by suspended solids such as silt and rock particles, will be collected and subjected to sedimentation processes as appropriate. The sludge deposited during the sedimentation process will primarily consist of silt, sand, and stone chips, and will be removed periodically and disposed of as onsite fill material or transported to a suitable off-site disposal area.

Operational Phase Solid Waste

Waste Characteristics

1.097
The proposed station will generate the following types of solid wastes: general refuse, sanitary sludge, roof and yard drainage system debris from catch basins, wastewater treatment system sludge, oil and chemical spill, cleanup sludge, pyritic refuse, FGD sludge, and fly and bottom ash. Table 1-16 summarizes the quantities and compositions of wastes other than coal ash and FGD sludge. To protect groundwater resources, the applicant has agreed to the following procedures:

- The transformer areas will be sealed with concrete or other suitable, impermeable materials. (Stipulation 80-17)

- The ignition oil tank, diesel fuel tank, and mobile equipment fuel tanks will be stored in outdoor diked areas in cases where these tanks are above ground. These areas will be sealed with asphalt, concrete or other suitable, impermeable materials. (Stipulation 80-17).

- Settling basins utilized in the treatment of building floor and equipment drainage will be lined with impermeable materials such as concrete or asphalt. (Stipulation 80-17).

The bottom ash handling system settling and recirculating basins will be lined with impermeable materials. The linings of solid waste disposal areas are discussed in the remaining paragraphs of this section of solid waste disposal.

General Refuse

1.098
General refuse typically includes. paper (newspaper, cardboard, brown, office and magazine); metals; food waste (vegetable and meat);

TABLE 1-16

SUMMARY OF ROUTINE OPERATION AND MAINTENANCE
SOLID WASTE

Solid Waste	Quantity (a)	Composition
General refuse	50	paper, food waste, yard rubbish, synthetics and inerts
Sanitary waste	0.35 dry weight	typical of domestic sludge undergoing secondary treatment
Roof and yard drainage system debris from catchbasins	0.25 dry weight	leaves and twigs
Wastewater treatment system sludge		
(i) settling basins and physical/chemical treatment unit	900 wet weight	(five percent solids) from the lake water removed by the water treatment and demineralizer system, coal pile runoff, floor and equipment drains, gas treatment and ash handling area yard drains, maintenance wastes from periodic equipment washes, and chemicals used to neutralize and precipitate the above wastewater and solids
(ii) oil separator oil	20	oil removed from contaminated solids
sediment	1	settleable and suspended solids
Spill sludge	negligible	acidic, alkaline or oily in nature
Pyritic refuse	11,000	metallic sulfides (primarily FeS_2)

a. All quantities are in tons per year except oil which is reported as gallons per year.

yard rubbish (leaves and wood); synthetics (plastics and rags); inerts (glass, ceramics, stones and dirt).

Paper will be the principal component of the refuse. Approximately 50 tons/yr (45.35 metric tons/yr) of general refuse will be produced by the station. General refuse will be periodically hauled from the station site to an approved sanitary landfill area in closed packer trucks operated by a contractor. The frequency of collection and transport is estimated as once per week.

Sanitary Waste

1.099
The sludge generated by the sanitary waste treatment system will be approximately 1.9 lb/day dry weight (.72 kilograms/day). The sludge will resemble that from an extended aeration treatment plant. As described for the construction period, the sanitary waste treatment system excess sludge will be collected and transported by a contractor. The frequency of collection and transport is estimated to be four times per year (depending on optimization of treatment procedures). The excess sludge from the sanitary waste treatment system will be disposed of at a municipal wastewater treatment system sludge processing facility or in an approved sanitary landfill.

Roof and Yard Drainage System Debris From Catch Basins

1.100
During routine operation and maintenance, roof and yard, drainage will be directed through catch basins. The material retained in the catch basins will characteristically include leaves and twigs. The quantity of this material is estimated at 0.25 ton/yr dry weight (0.227 metric tons/yr).

Debris removed via the roof and yard drainage system catch basins will be collected as required and transported by truck to an approved sanitary landfill disposal site. It is important to note that all potentially contaminated yard drainage, such as parking lot drains containing oil, will be directed to the wastewater treatment system as discussed previously.

Wastewater Treatment System Sludge

1.101
Sludge will be produced from the various wastewater treatment processes including:

a. Oil separation

b. Sedimentation

c. Physical/chemical treatment

Sludge associated with oil separation will consist of sand and grit particles (sediment) which enter the unit with the influent and are deposited under the quiescent conditions in the separator. Approximately one ton/yr (0.907 metric tons/yr) of sediment will be removed by the oil separator. A small quantity of waste oil (approximately 20 gal/yr) (75.7 liters/yr) will be separated during this operation and will be removed periodically for disposal in an approved area, or reused.

1.102
The wastewater treatment system will generate sludge in two unit processes. The first will be the waste equalization (holding-settling) basins which will function as sedimentation basins and will remove some settleable, suspended solids. The second operation is the physical/chemical treatment unit which, through introduction of coagulent chemicals and aides, will produce a chemical sludge. Approximately 900 tons per year (816.3 metric tons/yr) (net weight basis) of sludge will be produced by the wastewater treatment system. This sludge will consist of settleable, suspended and dissolved solids removed from liquid wastes, as well as coagulant chemicals used to flocculate and precipitate these solids.

1.103
Sludge generated in the settling basins, oil separator and physical/chemical treatment unit will be monitored by an operator, and will require periodic collection and transport via closed trucks. Sludge generated in the settling basins and physical/chemical treatment unit will be disposed of onsite or at approved landfill areas.

Spill Cleanup

1.104
Minor chemical spills will be diverted to the wastewater treatment system. Therefore, no sludge quantities are presented here. Accidental spillage of oil or chemicals from gross storage areas will be contained and, depending on the nature of the spill, treated in the wastewater treatment system, recovered and reused or delegated to a contractor for cleanup, transport, and disposal in an approved area. Appropriate transport vehicles will be used as necessary.

Pyritic Refuse

1.105
The term pyritic refuse refers to any of the common metallic sulfides

of which pyrite (FeS_2) is the most common. Pyritic refuse will be removed from the coal during the pulverizing operation. The quantity of pyritic refuse depends on the chemical constitution of the coal selected for fuel at Cayuga Station. The quantity of pyritic refuse is estimated to be approximately 11,000 tons/yr (9,977 metric tons/yr).

Pyrites will be disposed of and compacted in a segregated portion of the disposal site. The runoff and subdrainage from the pyrites storage area will be drained to a basin that is completely separated from the main ash fill drainage system. The pyrites will be encased in layers of compacted stabilized sludge to minimize potential infiltration of water and oxygen into the pyrites fill. The pyrite disposal area will ultimately cover an area of 10 acres (4.05 hectares) to an average depth of approximately 32 feet based on its 30-year disposal life.

Ash Disposal

1.106
Combustion of coal in the furnace causes the ash content to divide into two fractions: bottom ash and fly ash. Fly ash constitutes that portion of the total ash content which exits the boiler combined with the flue gas. For the proposed Cayuga Station at Somerset, fly ash will be collected in 99.7 efficient percent electrostatic precipitators and pneumatically conveyed to dry ash storage silos. Approximately 75 percent of the total ash is estimated to be converted to fly ash while 25 percent will be converted to bottom ash. Bottom ash constitutes that portion of the ash which, following combustion, falls to the lower section of the boiler and then undergoes mechanical grinding to produce particles small enough for sluicing.

1.107
Although the exact type and source of coal is presently unknown, a high sulfur coal from sources previously described in the section entitled "fuel" will be utilized. The average ash content for the identified coals varies from approximately eight percent to 20 percent. Typical ranges of the chemical characteristics of eastern, high sulfur coal are presented in Table 1-17. Average sulfur content is expected to vary from 1.8 to 32.

1.108
The FGD system will produce a 30 to 35 percent solids content sludge as an underflow stream of the mechanical sludge thickener. This FGD sludge will contain a mixture of excess calcium carbonate ($CaCO_3$), calcium sulfite ($CaSO_3.\frac{1}{2}H_2O$), calcium sulfate ($CaSO_4.2H_2O$), and inerts. The FGD sludge will be pumped to the stabilization process building where it will be further dewatered by vacuum

TABLE 1-17

EXPECTED COAL ASH CHARACTERISTICS FROM EASTERN COAL [a]

Constituent	Symbol	Percent by Weight		
		Base	Minimum	Maximum
Ferric oxide	FE_2O_3	16.7	10.9	24.0
Lime	CaO	1.3	0.95	8.40
Magnesia	MgO	1.2	0.04	1.8
Sodium oxide	Na_2O	0.03	0.01	0.5
Potassium oxide	K_2O	2.5	1.80	7.0
Silica	SiO_2	48.6	36.50	57.0
Alumina	Al_2O_3	26.3	12.50	32.1
Titania	TiO_2	1.8	0.80	1.8
Sulfur trioxide	SO_3	1.0	1.0	12.10
Phosphorus pentoxide:	P_2O_5	0.2	0.0	2.80
Undetermined		0.37	-	-

a. Homer City coal characteristics.

filters. The filter cake, contained 55 to 60 percent solids, will be combined with an approximately equal amount of fly ash and a predetermined amount of stabilization additive (lime or proprietary additive). Mixer discharge containing approximately 70 percent solids will be stockpiled via a radial stacker prior to being loaded onto trucks and hauled to the ultimate disposal area. For design purposes, the stock pile is sized to hold approximately three days of processed material. Additional surge capacity is provided for the sludge stabilization operation by an emergency pond designed to hold three days of thickener underflow. Fly ash not required in the stabilization process (i.e., excess fly ash) will be loaded into trucks via a dustless unloader and transported to the disposal area. Bottom ash will also be separately transported to the disposal area.

Stabilization reactions begin almost immediately after the addition of the fly ash and chemical stabilizer to the dewatered sludge. Stabilized limestone sludge can generally be immediately landfilled. In the landfill, slower chemical reactions continue for six to eight weeks before the ultimate strength of the compacted waste is essentially obtained. Bearing strengths of compacted stabilized sludge are in excess of four tons per square foot. Permeabilities of the stabilized sludge, as compacted in the landfill, decrease with time as the slower chemical reactions progress. Initially, permeabilities are on the order of 10^{-6} centimeters per second, decreasing to an ultimate permeability of about 10^{-8} centimeters per second. In other words, with time the compacted stabilized sludge becomes harder and stronger (age hardening). Additional typical characteristics of compacted stabilized sludge assumed in this report are a wet density of about 100 pounds per cubic foot and a solids content of 70 percent by weight. The stabilized product is an unsaturated material with a portion of the moisture content combined as water of hydration (i.e., chemically bound).

Properties of a specific stabilized sludge can be varied by adjusting the proportions of ash and additive to obtain the desired characteristics similar to those above. For the conceptual purposes of this study, it has been assumed that the fly ash to sludge dry weight ratio will be 1 to 1 and the additive rate will be 0.02 tons of additive per ton of total dry solids processed. The 1:1 ratio is used for conceptual design due mainly to economic considerations.

1.109
The stabilized sludge/ash disposal area was conservatively designed to ensure that worst-case type impacts due to waste disposal were evaluated. This would occur with coal producing the greatest volume of total waste and not necessarily with one having the greatest sulfur content. The design basis selected to be representative of the long-term worst-case for disposal considerations was a

coal with 19 percent ash, 1.5 percent sulfur and a heating value of 11,500 BTU per pound and 90 percent removal of sulfur from the flue gas. Under these conditions, the proposed facility will generate approximately 537,100 tons (487,246 metric tons) (dry weight) of ash and stabilized sludge per year. The disposal area capacity required will be approximately 10,218 acre-ft. over 30 years.

1.110
The Somerset stabilized sludge disposal site will occupy the eastern-most portion of the site, encompassing an area about 218 acres (88.3 hectares). Stabilized sludge piles will reach a maximum height of 70 to 80 feet (21.3 to 24.4 m) with finished side slopes averaging four horizontal to one vertical for erosion control. The disposal site will be developed in controlled phases and sequences) usually areas ranging from 6-14 acres) (2.43-5.67 hectares). Sequence development will proceed in the following manner:

- The stabilized sludge disposal area would be prepared by removal of vegetation, and the area graded as necessary. Topsoil cover will be stockpiled near the disposal area and vegetated for use later as final cover material.

- Due to the low to negligible permeabilities, the age-hardening characteristics, the lack of free water in the compacted stabilized sludge, as well as to the encapsulation of the excess fly ash within the stabilized sludge mass, no leachate formation is expected to occur. The stabilized sludge mass itself will effectively serve as a disposal area liner.

- Sedimentation ponds will be constructed partially inground to promote drainage from the lower portions of the fill operation and partially above ground utilizing sealed dikes. Four sedimentation ponds will ultimately be provided to treat the runoff from the fill areas.

- Stabilized sludge, excess fly ash, and bottom ash will be randomly unloaded, spread, and compacted in the active fill area. Excess fly ash will not be deposited on final fill surfaces, but will be encapsulated in the sludge mass.

- Stabilized sludge, having an initial consistency similar to moistened and compacted earth, will be used as the daily cover material for erosion and dust control.

- A minimum of 24 inches (30 cm) compacted soil cover will be placed over the disposal areas as the final surface of stabilized sludge is deposited and compacted. The soil cover will

consist of 18 inches (45.7 cm) of earth fill and a minimum six inches (15.2 cm) of topsoil capable of supporting vegetation. The applicant will revegetate the disposal areas after deposition of the topsoil. The revegetation program takes place within surficial soil layers which are placed after the completion of ash filling. The surface soil layers will be isolated from the stabilized sludge surface by a layer of coarse free draining material such as bottom ash to reduce the possibility of upward moving salts through capillary action during day periods. This is not, however, expected to be a problem.

Depending upon the type of revegetation materials being used, the following depths for surface soil will apply:

a. seeded areas and shrubs - two ft. minimum depth

b. tree planting areas - three ft. minimum depth

To promote revegetation, the surface soils will be irrigated and treated with lime and/or fertilizer. New plantings will be installed in surface soils after the ground surface has been stabilized by hydroseeding. New plantings will be compatible with native vegetation existing in the site vicinity.

The revegetation program of seeding and planting will establish replacement plantings and buffer plantings, and help to provide erosion control protection during construction operations.

Initial research efforts by Dravo Lime Company, as well as actual disposal site work by IU Conversion Systems, Inc., tend to indicate that no special problems should occur with the use of stabilized calcium sludge as fill material beneath the vegetative surface layer.

The entire fill area will be provided with berm and/or interceptor ditches to prevent uncontaminated surface runoff from entering as well as contain the potentially contaminated runoff.

1.111

The Somerset site stabilized sludge/ash landfill will be located in the easternmost portion of the site about 1,000 feet (304.8 m) from the Lake Ontario shoreline. This is the northernmost portion of the disposal site and is in an area where bedrock elevation is 260 feet (79.25 m). There will be approximately 100 feet (30.48 m) between Fish Creek and the disposal areas. The site is essentially flat and

will not disturb Fish Creek, and the woodlot, pond and unnamed stream in the northcentral portion of the site.

1.112
Monitoring of groundwater quality will include a sampling program designed to monitor groundwater both upstream and downstream of the disposal area. In addition, precipitation runoff monitoring will be provided by taking samples in the surface drainage ditches prior to their discharge into the sedimentation ponds and in ditches discharging effluent from the ponds. The disposal area, sedimentation ponds, and water monitoring locations are presented in Figure 1-3.

1.113
Trucks are required to transport stabilized sludge, excess fly ash, and bottom ash from the storage facilities adjacent to the FGD sludge stabilization building and the unit's precipitator. Ash transport requirements for this study are based on the Cayuga Station burning coal with 19 percent ash content and operating continuously at 100 percent load. Therefore, maximum daily fly ash and bottom ash production rates will be 1,255 tons/day (1,138 metric tons/day) and 418 tons/day (379 metric ton/day), respectively, for each day of the week. Based on trucking seven days of waste on five working days (35 work hours) using 40-ton capacity (off road) trucks, approximately 14 round trips will be required per hour.

1.114
An alternative onsite disposal area, located approximately three miles south of the plant site, has been considered. However, the applicant feels that there are significant economic disadvantages with this site. Estimated levelized annual costs for the onsite disposal area are $3,012,000 while the alternative site would cost $4,782,900. The possibility of using existing private facilities for offsite disposal was quickly eliminated for long-term use due to the extremely large waste volumes generated by Cayuga Station and the typically small municipal landfill capacities which are found in the Somerset area. For a more detailed discussion of site development sequencing and operation, see the Conceptual Engineering section of the Final Report on Cayuga Station Ash Disposal, which is on file in the Buffalo District office.

The Resource Conservation and Recovery Act of 1976 (RCRA) was established to promote the protection of health and the environment and to conserve valuable material and energy resources by proper waste disposal management plans and resource recovery. Subtitle C of the RCRA applies to the handling of toxic hazardous wastes and authorizes the Administrator, U.S. Environmental Protection Agency, to establish criteria for the listing of these wastes deemed hazardous.

Generators and transporters of solid wastes listed as hazardous will be required to meet standards and regulations to be established by the Administrator. Owners and operators of hazardous waste material treatment, storage, and disposal facilities will also be required to meet certain standards and regulations, and will be required to have a permit issued pursuant to Section 3005 of the RCRA. Should a determination regarding the toxicity of power plant solid waste result in listing of these wastes as hazardous, Subtitle C of the RCRA would apply to the proposed facility.

The U.S. Environmental Protection Agency believes there will be ample time available for any required site modifications if Subtitle C is deemed applicable since RCRA is scheduled for implementation in 1979.

If Subtitle C is not applicable to power plant solid wastes, the sanitary landfill criteria of Subtitle D, Section 4004 would apply. Implementation of these criteria is expected to encourage the recovery and utilization of solid waste by eliminating unacceptable disposal practices. Facilities which meet the criteria are practices which pose no reasonable probability of adverse effect on health and the environment. The RCRA also prohibits open dumps and mandates closing or upgrading of these facilities. Both onsite disposal at the proposed facility and any offsite disposal areas which may be used for station solid wastes will be subject to the RCRA in some manner.

POWER TRANSMISSION CORRIDOR

1.115
Planning of the transmission circuits which will connect the proposed Cayuga Station to both the existing and independently proposed transmission system of the New York Power Pool is only at a preliminary stage. While it is recognized that the impact of transmission lines must be considered in assessing a generating station, transmission line corridors in the State of New York are proposed independent of the generating station in accordance with Article VII of the New York State Public Service Law. In Article VII proceedings, the applicant may select several feasible power transmission corridors, but the final decision as to which corridor will be certified is made by the State. The corridor which is ultimately selected may or may not be the one proposed by the applicant. Thus, only generalized information is now available, and future studies by the applicant and the State may lead to differing proposals from those discussed in this impact statement. Detailed information on the Cayuga Station's associated transmission facilities will be provided to government as an integral part of the Article VII certification process. At this time, it is the applicant's opinion that a transmission corridor from the proposed station can be identified, constructed, and maintained

in an environmentally, socially, and economically acceptable manner. The following paragraphs describe the applicant's potential transmission configuration for the proposed Cayuga Station. (Figure 1-12)

1.116
Two single-circuit 345KV wood H-frame transmission lines will be constructed from the Somerset site to the Power Authority of the State of New York's (PASNY) existing northerly Niagara-Rochester 345KV transmission line, a distance of approximately 17.6 miles (28.2 kilometers). This connection will result in the establishment of two 345KV circuits: one Niagara-Somerset circuit and one Somerset-Rochester circuit. Extending in a southerly direction from the Somerset site, the proposed lines may follow existing unoccupied right-of-way owned by the applicant for approximately 15.1 miles (24.2 kilometers). Continuing in a southerly direction for an additional 2.5 miles (four kilometers) to PASNY's existing 345KV line, the proposed lines may be located on existing right-of-way owned by the applicant and may parallel NYSE&G's existing Stolle Road-Lewiston 230KV transmission line. A final transmission line route has not yet been selected.

Dysinger Substation

1.117
The applicant's plans for the Dysinger substation have been cancelled. Instead, the applicant will tie directly into the PASNY lines in the town of Royalton.

Design Standards and Construction Procedures

1.118
Design standards for transmission facilities meet or exceed all requirements for electrical clearances and for Grade B construction as set forth in the American National Standard, National Electrical Safety Code (ANSI C2, 1977 Edition). Design information for the proposed facilities is as follows:

Voltage: 345kV
Capacity (each circuit):

	Summer	Winter
Normal	1422 MVA*	1840 MVA
Long Time Emergency (LTE)	1721 MVA	2020 MVA
Short Time Emergency (STE)	1996 MVA	2295 MVA

*MVA Megavolt-Amperes)

Normal capacity is defined as the loading that may be carried through consecutive 24-hour load cycles without exceeding the appropriate maximum allowable temperature. Long Time Emergency (LTE) is defined as the loading that may be carried through infrequent, non-consecutive, 24-hour load cycles without exceeding the appropriate maximum allowable temperature. Short Time Emergency (STE) is defined as the loading that may be carried during infrequent contingencies of 15 minutes duration or less without exceeding the maximum allowable temperature. For the conductor proposed herein, the maximum allowable temperatures are 95°C, 115°C, and 125°C for normal, LTE, and STE conditions, respectively.

Conductor: Bundled 1192.5 MCM (Millions of circular mills) 45/7 aluminum conductor steel reinforced (ACSR); two conductors per bundle

Ruling Span: 800 feet (244 meters)

Clearance to Ground: 33 feet (10 meters) (with power flow equal to summer normal rating, conductor temperature equal to 95°C, ambient air temperature equal to 40°C, and wind to speed equal to 1.4 miles (2.3 kilometers) per hour)

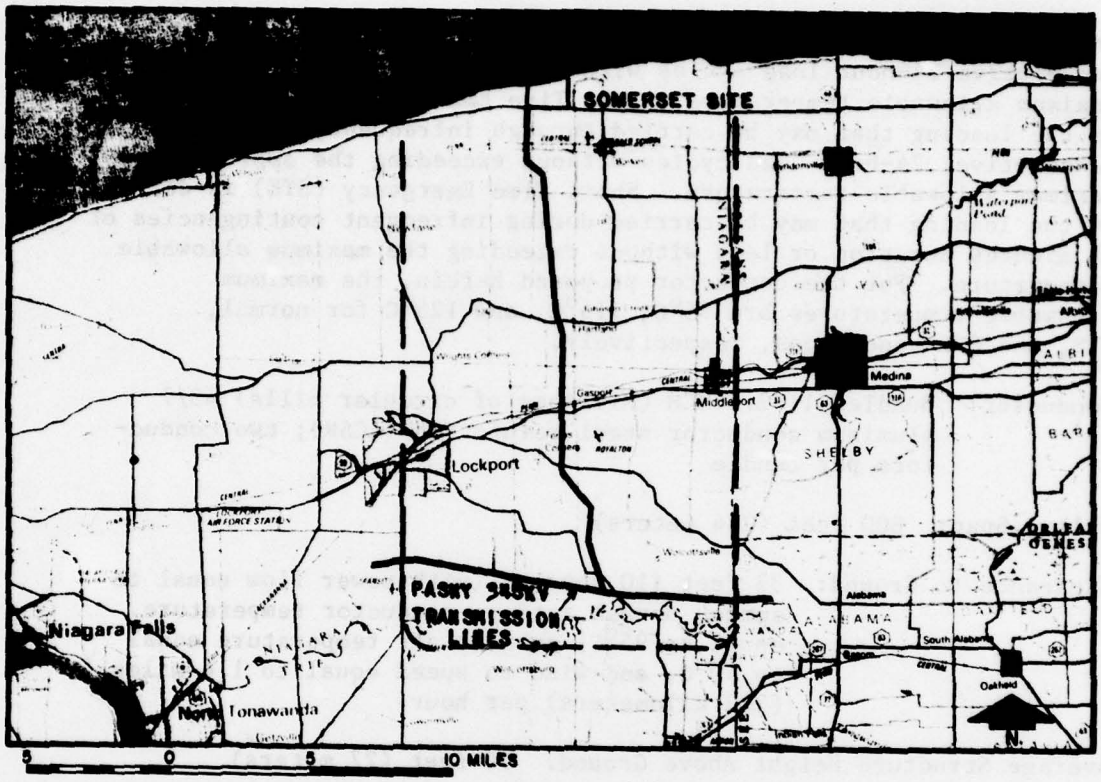
Average Structure Height Above Ground: 90 feet (27 meters)

Average Number of Structures per Mile: 13

Approximate Number of New Structures: 229

1.119
The applicant proposes to use 345 kV single-circuit wood tangent suspension structures. Typical dead-end structures for the proposed single-circuit 345kV facilities will be galvanized steel lattice towers. Wood structures will be brown in color; steel structures will be gray. Figure 1-12 shows the proposed route, substation locations, and the connections to the bulk power system. The length of the proposed right-of-way is 17.6 miles (28.2 kilometers); the width required for the proposed facilities is 250 feet (six meters); the total acreage is 533.3 acres (215.8 hectares). All required clearing will be done selectively. Only material that might potentially interfere with wire security or as required for construction and vehicular access will be removed. Woody material up to four inches (10 centimeters) in diameter will be piled, scattered, chipped, or burned. All woody material exceeding four inches (10 centimeters) in diameter will be limbed, freed of forks, and toplopped at a diameter of four inches (10 centimeters). The material exceeding four inches (10 centimeters) in diameter may be disposed of by selling and

FIGURE 1-12



PROPOSED TRANSMISSION ROUTE

LEGEND

TWO SINGLE-CIRCUIT 345KV H-FRAME TRANSMISSION LINES

TRANSMISSION PROJECT AREA

removing from the site, piling, or scattering. Unmerchantable logs will be considered for burning.

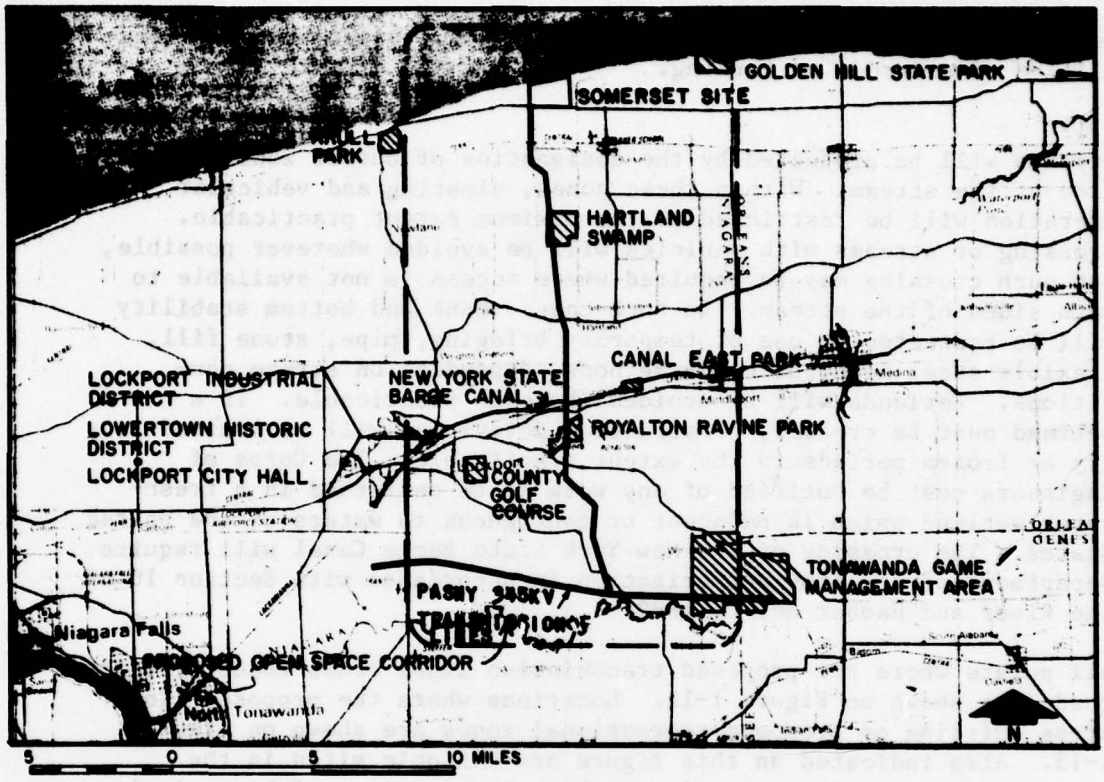
1.120
Streams will be protected by the designation of buffer zones on each side of the stream. Within these zones, clearing and vehicular operation will be restricted to the maximum extent practicable. Crossing of streams with vehicles will be avoided wherever possible, but such crossing may be required where access is not available to both sides of the stream. In such cases, bank and bottom stability will be protected by use of temporary bridging, pipe, stone fill, flexible steel mesh, or other methods, depending on stream conditions. Wetlands will be avoided wherever practicable. If a wetland must be crossed, construction activities will be limited to dry or frozen periods to the extent practicable. The Corps of Engineers must be notified of any work to be performed in a freshwater wetland which is adjacent or contiguous to waters of the United States. The crossing of the New York State Barge Canal will require Department of the Army authorization in accordance with Section 10 of the River and Harbor Act of 1899.

All points where the proposed transmission lines cross roads or railroads are shown on Figure 1-12. Locations where the proposed lines cross existing or proposed recreational zones are shown on Figure 1-13. Also indicated on this figure are historic sites in the transmission project area. As can be seen, no sites of historical significance are crossed by the proposed lines. Locations where the proposed transmission lines cross agricultural districts or areas of high agricultural viability are shown on Figure 1-14.

1.121
To the best of the applicant's knowledge, no recorded Indian sites are traversed by the proposed route, although some areas of potential archaeological sensitivity may be contained within the transmission project area. Should any resources of apparent archaeological significance be unearthed during construction, the applicant will cease work at that location and notify the New York State Public Service Commission and the State Archaeologist. The proposed transmission lines will not present any hazard to aerial or marine navigation. Airports in the transmission project area are shown on Figure 1-15. The applicant will comply with all Federal Aviation Administration (FAA) regulations concerning airports.

1.122
The transmission right-of-way will be maintained by removal of undesirable vegetation through mechanical or chemical means. A principal goal of the maintenance program will be to establish a stable community of low-growing plant material on the right-of-way.

FIGURE 1-13

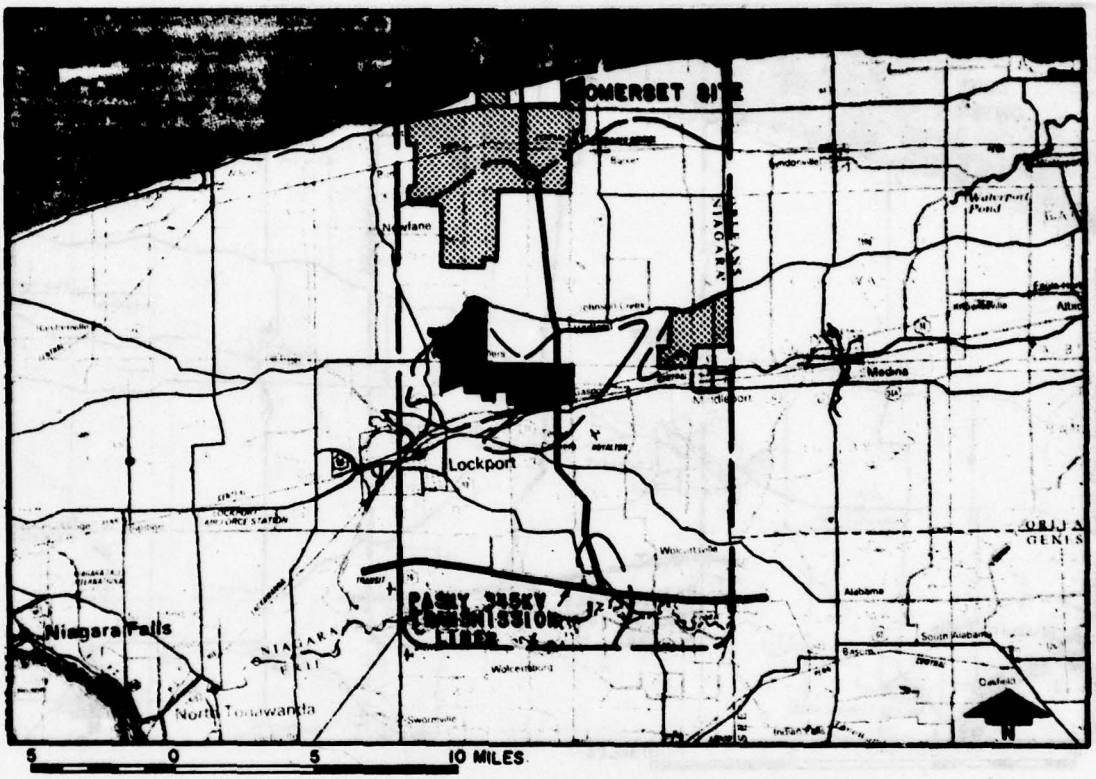


RECREATIONAL ZONES AND HISTORIC SITES
IN THE TRANSMISSION PROJECT AREA

LEGEND

- PROPOSED ROUTE
- HISTORIC SITES
- EXISTING RECREATIONAL ZONE
- PROPOSED RECREATIONAL ZONE
- TRANSMISSION PROJECT AREA

FIGURE 1-14

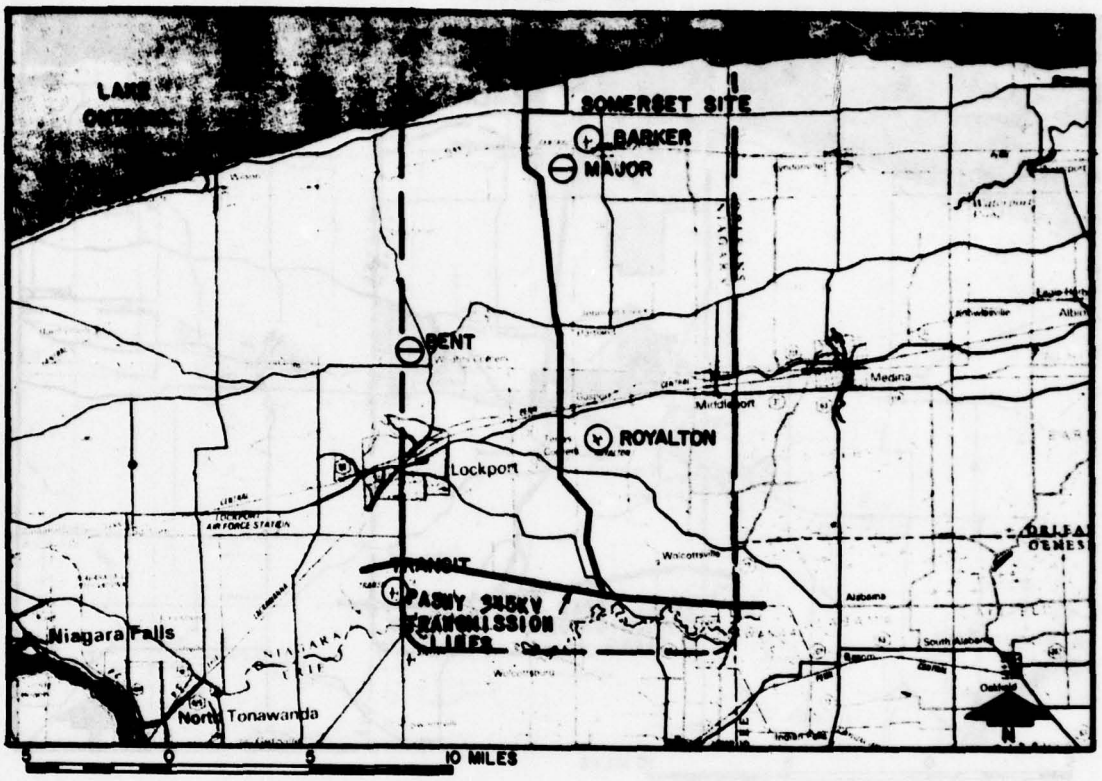


AGRICULTURAL DISTRICTS
AND AREAS OF HIGH AGRICULTURAL VIABILITY IN THE TRANSMISSION PROJECT AREA

LEGEND

- PROPOSED ROUTE
- AGRICULTURAL DISTRICTS
- DESIGNATED AREAS OF HIGH AGRICULTURAL VIABILITY
- TRANSMISSION PROJECT AREA

FIGURE 1-35



AIRPORTS
IN THE TRANSMISSION PROJECT AREA

LEGEND

——— PROPOSED ROUTE

○ PUBLIC-USE AIRPORTS

⊖ RESTRICTED-USE AIRPORTS

— — TRANSMISSION PROJECT AREA

Herbicides approved for use by the United States Environmental Protection Agency and by the New York State Department of Environmental Conservation will be used both during clearing operations and during subsequent maintenance operations. Application will be made by personnel walking the right-of-way with individual nozzle equipment, in order to restrict coverage to the material requiring treatment. Herbicide application will be limited to the individual trees or stumps to be treated. Herbicides will be applied only when weather conditions will permit controlled application and will not result in runoff damage to adjacent property.

ATMOSPHERIC DISCHARGES

1.123
The proposed 850 megawatt Cayuga Station at Somerset will be a base load facility with annual average capacity factors as given in paragraph 1.022. The air contaminant discharges from this unit which are discussed in this section are based on load factors which will give rise to maximum atmospheric discharges although actual electrical power production will not always result in these air contaminant discharge rates.

State and Federal Emission Standards

1.124
To minimize the Cayuga Station's contribution of air contaminants to the surrounding area, commercially available air quality control equipment and techniques will be incorporated in the design of the steam generator and flue gas treatment systems. The resulting emission levels will be in compliance with recently applicable Federal and State emission regulations. The present Federal standards of performance for new stationary sources are shown on Table 1-18.

The U.S. Environmental Protection Agency (EPA) in accordance with the Clean Air Amendments of 1977, is revising the New Source Performance Standards (NSPS) and Prevention of Significant Deterioration Regulations (PSD). The revised regulations will require best available control technology with percentage reduction requirements in addition to fixed emission limitations. As of June 1978, the proposed facility has been determined to be an old source under the NSPS regulations, and hence not subject to any new NSPS regulations. However, the proposed facility will be required to meet the current new PSD provisions, and as of June 1978, the applicant is seeking a Federal Prevention of Significant Deterioration (PSD) Air Quality Permit from the EPA Region II as required under the Clean Air Act Amendment of 1977. The applicant has proposed SO_2, NO_x, and particulate emission control systems for this PSD permit application in

TABLE 1-18

FEDERAL STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

Parameter	Coal Fired	Oil Fired	Gas Fired
1. Sulfur Dioxide[a] - lb/MBtu	1.2	0.80	-
2. Particulate Matter - lb/MBtu	0.10	0.10	0.10
3. Nitrogen Oxides[a] (as nitrogen dioxide) - lb/MBtu	0.70[b]	0.30	0.20
4. Opacity - percent[c]	20[d]	20[d]	20[d]

[a] Maximum three-hour average.

[b] Except for lignite-fired steam generators.

[c] Maximum six-minute average.

[d] A maximum of 40 percent is allowed for two minutes in any hour.

order to satisfy the best available control technology (BACT) requirements of the interim proposed Federal PSD regulations. The proposed BACT incorporates flue gas desulfurization (FGD) with at least 80 percent SO_2 removal. The maximum facility emissions for the proposed BACT are 1.2 lbs $SO_2/10^6$ BTU, 0.7 lbs $NO_x/10^6$ BTU, and 0.05 lbs of particulate per 10^6 BTU. As of June 1978, these are the maximum facility pollutant emission rates expected to be certified by either EPA Region II and/or the New York State Public Service Commission Siting Board. These pollutant emission rates are equal to or below those currently required under the existing EPA and New York State Regulations. All subsequent discussions of atmospheric discharges and air quality impacts of the proposed facility are based on these maximum expected pollutant emission rates, even though the final facility emission rates may be less than these proposed levels.

1.125
New York State Department of Environmental Conservation has established emission limitations and regulations applicable to fossil fuel-fired steam generators of more than 250 million British thermal units (MBtu) of heat input. A listing of the State emission regulations applicable to the proposed plant is presented in Table 1-19.

Emission Rates

1.126
The expected emission rates, in pounds per 106 Btu of heat input and pounds per hour at 100 percent load for carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), hydrocarbons (HC), photochemical oxidants, and particulate matter from the proposed facility, are presented in Table 1-20. The firing rate of the proposed facility at 100 percent load (valves wide open, 5 percent overpressure) is 7.953×10^9 Btu/hr.

1.127
The proposed facility will include two oil-fired auxiliary boilers. It is expected that they will operate a 100 percent capacity less than one percent of the time. The expected emission rates, in pounds per 10^6 Btu of heat input, for the various pollutants are given in Table 1-21. The maximum firing rate for each auxiliary boiler is 1.93×10^8 Btu/hr. The plant's emergency fire pumps and emergency generator will be diesel powered. In addition, there will be several pieces of mobile coal handling equipment and a yard locomotive. Principal pollutant emissions from such equipment include carbon monoxide, nitrogen oxides, and hydrocarbons.

TABLE 1-19

NEW YORK STATE STANDARDS OF PERFORMANCE
FOR STATIONARY COMBUSTION INSTALLATIONS

Parameter	Coal Fired	Oil Fired	Gas Fired
1. Sulfur Dioxide[a] - lb MBtu	1.2	0.8	-
2. Particulate Matter - lb/MBtu[b]	0.10	0.10	-
3. Nitrogen Oxides (as nitrogen dioxide) - lb/MBtu	0.70	0.30	0.20
4. Opacity - percent	20[c]	20[c]	20[c]

[a] New York State limits the fuel sulfur content to 0.6 pound of sulfur per MBtu for coal-fired and 0.75 percent sulfur by weight for oil-fine facilities, however, certain exceptions may be allowed. Fuel with a sulfur content in excess of that regulated may be utilized where a sufficient portion of the sulfur in the fuel would be retained in the ash and the resulting emission of sulfur compounds (expressed as sulfur dioxide) does not exceed 1.2 pound per MBtu for coal-fired and 0.80 pound for oil-fired facilities.

[b] Maximum 2-hour average.

[c] A maximum of 40 percent is allowed for 3 minutes in any 60-minute period.

TABLE 1-20

MAXIMUM ESTIMATED POLLUTANT EMISSION RATES

Pollutant	lb/10^6Btu	lb/hr
CO[a]	0.042	333
NO_x (as NO_2)[b]	0.7	5,567
SO_2[b]	1.2	9,544
HC[a, c]	0.013	100
photo-oxidants[d]	negligible	negligible
particulates[b]	0.05	398

a/ Based on large pulverized bituminous coal boiler emission factors from "Compilation of Air Pollutant Emission Factors," Second Edition, U.S.EPA, AP-42, 1973.

b/ Based on maximum expected facility emissions specified in a Federal PSD Permit currently being sought by the applicant as of June 1978.

c/ Recent emissions tests on pulverized coal-fired boilers indicate that non-methane hydrocarbon emissions are expected to be only about 1/30 of the AP-42 values. This would make the proposed facility a non-major source (100 tons/year) of non-methane hydrocarbons; as is discussed in Chapter 4.

d/ Based on oxidizing conditions in furnace, there should be an oxidant deficit in the stack gases as compared to the ambient air.

TABLE 1-21

AUXILIARY OIL-FIRED BOILERS
ESTIMATED POLLUTANT EMISSION RATES

Pollutant	:	$lb/10^6$ Btu
CO[a]	:	0.02
NO_x[b]	:	0.25
SO_2[b]	:	0.10
HC[a]	:	0.014
photo-oxidants[c]	:	negligible
particulates[a]	:	0.06

a. Based on large oil-fired boiler emission factors from "Compilation of Air Pollutant Emission Factors," Second Edition, USEPA, AP-42, 1973.

b. Based on the Article VIII Application, Form B-1-a, Section 72.2.

c. Based on the oxidizing conditions in the boilers, there should be an oxidant deficit in the stack gases as compared to the ambient air.

Radioactive Emissions

1.128
Coal ash may contain trace quantities of various radioisotopes from the uranium and thorium decay series. Since the specific coal source(s) for the proposed facility have not yet been selected, the specific quantities of each radioactive nuclide expected in the stack emissions cannot be identified. Very limited information exists in the literature concerning the typical range of concentrations of radioactive nuclides in coal. Martin, et al, (1971), report the total activity in coal ash of radium and thorium isotopes is about 10.6 picocuries/gram (pc/gm), for coal used in the Widows Creek (A) Station. Eisenbud and Petrow, (1964), report the following average radioactive nuclide concentrations from the ash of six samples of Appalachian semi-bituminous coal: Ra-226 3.8 pc/gm, Ra-228 2.4 pc/gm, and Th-228 2.6 pc/gm.

For comparable data reported for western coal, the Huntington Canyon (Utah) Environmental Report (NA) reports the following radioactivity in coal ash from the Blind Canyon Seam of the Deer Creek Mine: Ra-226 1.5 pc/gm, Ra-228 1.7 pc/gm, Th-228 1.7 pc/gm, and Th-232 1.6 pc/gm. The Kaiparowits (Utah-Four Corners Area) Environmental Report, ND, reports the following radioactivity in coal for a proposed coal source (values calculated from a coal ash basis for the average ash content of 9.25 percent): Ra-226 1.4 pc/gm, Ra-228 1.9 pc/gm, Th-230 3.1 pc/gm, Th-232 1.8 pc/gm.

1.129
The proposed facility will consume 7.292×10^9 Btu/hr at 100 percent of turbine nameplate load (850 MW). Assuming stack emissions of 0.03 kilograms of particulates (ash) per 10 Btu, and a radioactivity in the emitted ash to be represented by the above cited references, the radioactive emissions from the proposed facility can be estimated in terms of millicuries/year/1000 MWe. Table 1-22 presents such estimated emission rates for the proposed facility based on of available radioactivity data. While a range of eastern bituminous coals is presently under consideration for the proposed facility, the data from Table 1-22 should not be taken as necessarily representative of the coals that will ultimately be used in the proposed facility.

Trace Element Emissions

1.130
Coal may contain trace quantities of various trace elements and heavy metals. Since the specific coal source(s) for the proposed facility has not yet been selected, the specific quantities of trace elements expected in the stack emissions cannot be identified. However, the

range of concentrations of various trace elements in various coals, and studies on the degree of vaporization or volatilization of these elements in coal-fired boilers, can be found in the literature.

Magee (1973) has compiled measured data on the ranges of trace element concentrations from various coals. Reports exist on the degree of volatilization of each trace element, and this information can be examined to estimate the maximum estimated fractional emission rate of each element from the boiler and electrostatic pre-cipitators into the stack. Table 1-23 summarizes the available information on trace element emissions.

In Table 1-23 the 90 percent + concentration range of various trace elements from Magee for eastern coals are presented. The maximum estimated stack emissions for the proposed facility are based on a maximum coal consumption of 302,098 kilograms of coal/hr, (11,940 Btu/lb) a maximum heat input of 7.953×10^9 Btu/hr, the maximum trace element concentration reported for eastern coal, and the maximum estimated fractional volatilization from the literature. In all cases, the minimum fractional emission assumed was 10 percent. The trace element concentration data reported in Table 1-23 may not necessarily be representative of the coal(s) that will be used in the proposed facility. Also, the maximum estimated trace element emission rates in the table are only gross approximations, and may be significant overestimates of the actual quantities of trace elements that will be emitted from the proposed facility.

TABLE 1-22

ESTIMATED RADIOACTIVE EMISSION RATES FOR THE PROPOSED FACILITY BASED ON AVAILABLE DATA FROM LITERATURE MILLICURIES/YEAR/1000 MWe

Radioisotope	Eisenbud & Petrow
Radium - 226	6.5
Radium - 228	4.1
Thorium - 228	4.4

TABLE 1-23

ESTIMATED TRACE ELEMENTS, COAL COMPOSITION,
AND MAXIMUM ESTIMATED STACK EMISSIONS
FOR THE PROPOSED FACILITY

Element	ppm in Coal Eastern	Maximum Estimated Stack Emission ($lb/10^9$ Btu)
Arsenic	3-59	1.23
Beryllium	0.6-4.1	0.04
Chromium	4.1-25	0.21
Copper	3.4-37	0.31
Fluorine	10-190	15.9
Lead	4-14	0.11
Manganese	6-124	1.04
Mercury	0.07-0.41	0.04
Nickel	2.4-37	0.31
Vanadium	2.4-44	0.36
Zinc	0-36	0.30

Emission Control Systems

1.131
The allowable emissions of sulphur dioxide, nitrogen oxides, and particulates from the proposed facility are limited by the Federal EPA New Source Performance Standards (NSPS). The purpose of the emission control systems that will be incorporated into the proposed facility are to limit the facility emissions of the above contaminants to be equal to or less than the NSPS.

1.132
The implementation of the flue gas desulfurization system will ensure compliance with NSPS for SO_2 emissions. Integration of a stack gas reheat system into the FGS system will further reduce SO_2 emissions and also reduce corrosive effects on facility equipment. This topic is discussed in greater detail in Appendix D.

1.133
Nitrogen oxides will be controlled by boiler design. The boiler that will be used in the proposed facility is designed and guaranteed by the manufacturer to meet the NSPS. Hence, no additional or external control equipment for nitrogen oxides will be employed.

1.134
High efficiency electrostatic precipitators have been incorporated into the plant design to collect particulates. The electrostatic precipitators will be located between the boiler house and the stack. The specification for the precipitator and the precipitator guarantee will include a minimum efficiency of 99.7 percent. With a coal ash content of 16.2 percent, total particulate emissions will be about 0.01 kilograms/10^6 Btu, or 30 percent of the NSPS. Coal fly ash will be collected in the precipitator hoppers and pneumatically conveyed to onsite fly ash storage silos. Fly ash will normally be pneumatically conveyed to the FGD sludge stabilization facility where it will be mixed with dewatered FGD sludge and a stabilization additive. The stabilized product will be loaded into trucks for transport to the onsite landfill disposal area.

Ground Level Concentrations

1.135
The Federal ambient air quality standards that apply to the proposed station contribution to ambient air quality levels are those found in 40 CFR 52, "Prevention of Significant Air Quality Deterioration" (PSAQD). In the PSAQD regulations, the EPA designated allowable limits for increases of SO_2 and particulate matter (TSP) over the baseline air quality concentrations. All areas were designated as

Class II; the incremental limits for these areas are given in Table 1-24. As indicated in this table, the maximum ground level concentrations resulting from the proposed facility are substantially below the allowable Class II limits in each case.

Appendix B discusses the mathematical diffusion models utilized for this study.

PLANT HEAT DISSIPATION SYSTEM

1.136
The turbine exhaust will be cooled using a one pass, longitudinal condenser that uses water drawn from and returned to Lake Ontario. At 100 percent capacity, approximately 851,625 lites per minute of water will be raised 19°C by the transfer of 3.62×10^9 Btu/hr of heat removed from the condensing steam. To keep the condenser operating as efficiently as possible the internal surfaces of the condenser tubes will be cleaned using the Amertap mechanical cleaning system. Operating experience with other plants on Lake Ontario (i.e. Nine Mile Point Unit No. 1) has shown that the silt content of the lake water is high enough that scouring action prevents biological fouling; hence, a biocide will not be used.

The Anticipated Behavior of the Thermal Plume

1.137
This section will discuss the physical and hydrological features of the site that are relevant to the behavior of the discharge and intake flows and how these features were incorporated into analysis of these flows.

The general problem of predicting the behavior of condenser water intake and discharge flows is a complex one, involving the combined effects of induced jet momentum, buoyancy, advection by receiving water currents, diffusion by natural turbulence, and the constraints imposed by bottom and lateral topography. No single analytical technique is capable of accounting for all of these processes. However, it is usually possible to partition the problem into several individual regions, each of which is governed by subsets of the physical processes mentioned above. The analysis of the Somerset Site intake and discharge flows involved the definition of four such regions that are discussed below. It should be noted that these categorizations relate primarily to the analysis of the discharge flow; the behavior of the intake flow is included in the discussion of the near field mixing zone.

TABLE 1-24

RESULTS OF GAUSSIAN DISPERSION MODEL
CALCULATIONS FOR THE PROPOSED FACILITY ALONE
PROPOSED (PRIME) EMISSION CONTROL SYSTEMS

Contaminant	Averaging Time	Operating Load (Percent)	Maximum Calculated Ground-Level Concentration(ug/m^3)	Federal PSAQD Standard(ug/m^3)	Percent of Standard
SO_2	3 hr	100	412*	512	80
		75	337*	512	66
		50	269*	512	53
SO_2	24 hr	100	60	91	66
		75	58	91	64
		50	42	91	46
SO_2	Annual	100	1.6	20	8
		75	1.3	20	7
		50	1.0	20	5
TSP	24 hr	100	2.5	37	7
		75	2.4	37	6
		50	1.8	37	5
TSP	Annual	100	0.07	19	0.4
		75	0.06	19	0.3
		50	0.04	19	0.2

*These maxima are associated with the lake breeze fumigation condition.

Initial Jet Mixing Region

1.138
This zone is dominated entirely by the self-induced turbulent mixing of the discharge and extends from the discharge structure to the point where other influences such as the presence of the lake bottom, water surface, or adjacent discharge ports have a significant effect on the induced mixing and the jet trajectory. This region is a function only of the following factors: the discharge velocity and temperature; and, the port diameter and angle with the horizontal.

For the Somerset discharge design, this region extends no farther than 50 to 100 feet (15 to 30 meters) from the discharge ports. By thus restricting the definition of the initial jet mixing region, the flow and temperature distribution may be analyzed using classical jet theory (Albertson, et al., 1950) to predict the following aspects of the discharge flow:

- Temperature and velocity exposure vs. distance along the jet centerline. This information is of use in evaluating entrainment and impingement losses (see Chapter 4, "Impact of Heat Dissipation System.")

- Volumes within given values of induced temperature use.

The analysis of the flow leaving each discharge port yielded the following information:

a. Temperature and velocity exposure vs. distance along the plume centerline. These results are presented in Table 1-25.

b. The maximum induced temperature rise on the bottom and at the surface were calculated to be as follows:

	Surface	Bottom
Maximum induced velocity	1.9 fps	4.0 fps
Maximum induced temperature rise	4.2°F	6.7°F

These values are conservative estimates of maximum excursions that will occur over extremely small bottom and surface areas.

Near Field Mixing Zone

1.139
This region includes the portion of the temperature distribution that is determined by the mixing induced by the discharge configuration as

TABLE 1-25

TEMPERATURE AND VELOCITY EXPOSURE
ALONG PLUME CENTERLINE

Isotherm(°F)	Total Time	Total Flow	Velocity (fps)
35	.88	528	15.00
32.5	.95	569	13.93
30	1.04	616	12.86
27.5	1.15	672	11.79
25	1.30	739	10.71
22.5	1.50	821	9.64
20	1.79	924	8.57
17.5	2.20	1,056	7.50
15	2.85	1,232	6.43
12.5	3.89	1,478	5.36
10	5.83	1,848	4.29
9	7.09	2,053	3.86
8	8.86	2,310	3.43
7	11.44	2,640	3.00
6	15.41	3,080	2.57
5	22.00	3,696	2.14
4	34.13	4,620	1.71
3.6	41.86	5,133	1.54

a whole (rather than one individual port) in conjunction with the lake topography and currents. In general this region extends no more than a thousand feet (305 meters) from the discharge point. Because of the complexity of the interaction between the discharge and the local receiving water features (water depth and velocity), a physical model study is usually required to analyze the temperature distribution in this region.

This region is governed by the following factors:

- The location of the intake and discharge structures with respect to each other and to the shoreline and bottom topography.
- The total depth of water at the intake and discharge structures.
- The geometrical configuration of the discharge structure.
- The magnitude and direction of the receiving water current.

1.140
The primary hydrodynamic phenomena in this region is the flow and mixing induced by the intake and discharge. Because of the complexity of these processes, a physical model study is usually required to obtain an estimate of the temperature and flow distribution in this region.

For the Somerset Site, a physical model study was conducted by the Parsons Laboratory for Water Resources and Hydrodynamics, Department of Civil Engineering, Massachusetts Institute of Technology. The model reproduced a region 4,000 feet (1,219 meters) offshore and 6,000 feet (29 meters) alongshore at an undistorted scale of 1:100 according to conventional hydrothermal practice (Stolzenbach, K.D. and Harleman, D.F.R. 1975). Besides the intake and discharge structures, the model included the following physical features: (a) The lake bottom topography, modeled as a uniform slope of 1:73.5; (b) Steady, horizontally uniform longshore lake currents ranging in magnitude from 0 to 0.6 fps (0 to 0.2 meters per second); and (c) an isothermal receiving water.

1.141
The model study did not treat unsteady currents or stratified receiving waters for the following reasons: First, the effect of time-variable current conditions is treated in the context of the transient plume region analysis discussed below. Secondly, the stable seasonal stratification in Lake Ontario is not expected to have a significant effect upon the performance of the proposed

discharge and intake structures because the discharge and intake flows will interact primarily with the upper layers of the lake with depths less than 30 to 40 feet (9 to 12 meters). Because of the intermittent and transient nature of these events and because the natural changes associated with the thermocline tilting are likely to exceed induced changes by an order of magnitude, the effects of upwellings or downwellings in the intake and discharge flows were not considered in the near field study. Similarly, because of the distance from the Somerset Site to the nearest operating power station (50 miles) (80 kilometers), it was assumed that the effects of other intake and discharge flows would be negligible.

1.142
For all of the alternatives investigated, and particularly for the final design, the following types of data were obtained from the model study: (a) Temperature distributions in three dimensions; (b) Intake temperature rises for determination of recirculation; (c) Qualitative observations of induced flow patterns; and (d) Quantitative measurements of induced surface velocities along the plume centerline.

The model study was used to investigate alternatives among the following design parameters: (a) Condenser temperature rise and flow; (b) Discharge location (depth of water and discharge offshore); (c) Discharge design (submerged and surface); and (d) Intake location.

1.143
Procedures leading to the final design are summarized below:

- Submerged discharges produced significantly lower temperature rises in the mixing zone.

- Of the submerged diffuser designs tested, the staged diffuser configuration performed better than either the tee or oblique designs, primarily because for a staged diffuser the highest induced temperature occurs during conditions of zero receiving water current velocity with better mixing being achieved for non-zero current conditions in either direction. In contrast, the tee and oblique designs both performed best during periods of zero current and achieved poorer dilution for some non-zero current values. Because the Somerset site is characterized by relatively short periods of slack currents, it was concluded that the staged diffuser was the best choice.

- The effects of condenser temperature rise, condenser flow, diffuser length, discharge velocity, port angle, and port spacing on the induced temperature distribution were not large

except for extreme values of these parameters. Accordingly, the final diffuser design primarily reflects engineering and cost considerations.

- Induced temperature rises at the intake were small (less than 1.5 to 2°F (.8 to 1.1°C) for all the designs tested, indicating negligible recirculation. It is expected that actual recirculation will be less because the final design has a 1,000-foot (305 meters) spacing between intake and discharge while the model tests were performed with a separation of no more than 500 feet (152 meters).

1.144
The physical model study determined the three dimensional near field temperature distribution for ambient current velocities of 0, 0.25 and 0.6 fps. Appendix C shows the surface and cross sectional distributions of induced temperatures for these cases. Table 1-26 gives the total surface area occupied by surface temperature increase as a function of current speed for various seasons. The transient far field plume temperature is projected to have a negligible ($< 0.26°F$) average effect upon temperature in the mixing zone.

Transient Far Field Plume Region

1.145
The inner boundary of this region is roughly associated with the outer boundary of the near field mixing zone region. Within the transient plume region, the induced temperature distribution is dominated by natural turbulent diffusion, surface heat loss, and advection by transient lake currents. The temperature distribution is correspondingly unsteady and, during slack periods of current reversals, a buildup of heat may occur in the vicinity of the discharge that causes an induced background temperature rise to be superimposed upon the near field region. The transient plume region is regarded as extending several miles from the discharge point, beyond which induced temperature rises are less than 0.5°F (0.27°C). Because of the difficulty of modeling this large area in the laboratory, an analytical transient plume model (Adams, 1975) is used.

Far field isotherms are presented in Appendix C.

The basic assumptions and structure of the transient plume model are as follows:

- The input of heat into the receiving water is from a virtual source whose location and size is chosen to reflect the characteristics of the near field mixing zone as determined by the physical model study.

TABLE 1- 26

ESTIMATED SIZE OF AREAS OF NEAR FIELD SURFACE TEMPERATURE RISES
INDUCED BY THE PROPOSED FACILITY

Model Test Currents Speed	Associated Current Speed Range	Percentage of Occurrence*				Surface Areas (acres)		
		Dec-Feb	Mar-May	June-Aug	Sept-Nov	3.0°F Isotherm	2.8°F Isotherm	2.5°F Isotherm
0 fps	0.0 - 0.1 fps	38.01	33.35	42.59	31.09	0.7	0.9	1.5
0.25 fps	0.1 - 0.4 fps	48.61	53.05	51.23	59.85	0	2.6	9.0
0.6 fps	> 0.4 fps	13.38	13.06	6.18	9.06	0	0	0

*Figures are estimated percentages of the time that a given current speed (and resulting size of surface area) occur during these months.

- The plume is advected by a horizontally uniform time varying longshore current as measured by the fixed current meters installed at the site.

- The vertical and horizontal diffusion of the plume is determined by diffusion coefficients taken from previous dye studies in the Great Lakes and other large water bodies (Murthy, 1970).

- Surface heat loss is controlled by a heat exchange coefficient selected to reflect wind speeds typical of the Somerset site.

- The lake bottom was considered to be uniformly sloping at 1:73.5.

Large Scale Far Field Region

1.146
Beyond the transient plume region the induced temperature distribution is determined by the large scale features, such as tidal surface area and net flushing rate, of the receiving water body. In relatively small receiving water bodies, the large-scale temperature increases may be significant. However, for Lake Ontario it may easily be shown that lakewide induced temperature increase associated with the proposed plant will be less than 0.005°F (0.0027°C). Accordingly, no additional analysis of this region was performed.

New York State Thermal Plume Analysis (NYSPSC, NYSDEC)

1.147
The New York State Water Quality criteria Part 704.3 establishes mixing zone criteria. Section 704.3(a) requires the State specify definable numerical limits for mixing zones, such as linear distances from the point of discharge, surface area involvement, or volume of receiving water entrained in the thermal plume. Considering this requirement, and the criteria for lakes, 704.2(b)(3)(1), which prescribes that the water temperature at the surface of a lake shall not be raised more than 3°F (1.6°C) over the temperature that existed before the addition of heat of artificial origin. The mixing zone in this case will be defined as the extent of the 3°F (1.6°C) isotherm above ambient lake temperature. Therefore, under the above criteria the State reviewed the applicant's data.

1.148
In reviewing the applicant's computations relating to the distribution of heat in receiving waters from the proposed discharge, it was determined that a radius of 500 feet (152 M) from the point of discharge defines the area of the mixing zone. Thus, at no time should the 3°F (1.6°C) isotherm, after addition of heat of artificial

origin (in this case 524 cfs of water discharged at 35°F (19°C) above ambient) encompasses an area of greater than 18 acres. However, under normal conditions, the actual size of the mixing zone should be approximately one acre. At no time should the shore zone be affected by the 3°F (1.6°C) isotherm.

COST OF THE FACILITY

1.149
The cost of the proposed station is expected to be $451,000,000 plus $119,000,000 for interest during construction. Based on estimated 1984 price levels and a levelized capacity factor of 77.6 percent, annual operating and maintenance costs of the facility are expected to be $151,675,000. The total estimated cost for associated transmission facilities for the station is $12,147,000.

No Federal funds are involved in either the construction or operation of the proposed power station.

PROJECT CONSTRUCTION SCHEDULE

1.150
Construction of the proposed station at the Somerset site will commence in April 1979 (site preparation) and will be essentially completed in June 1983 (first steam to turbine). The construction schedule is contained in Table 1-27. Total construction duration is expected to be 50 months.

PERMITS REQUIRED

1.151
Permits required for the construction and operation of the proposed station are listed in Table 1-28.

BENEFITS OF THE PROPOSED FACILITY

1.152
Construction of the proposed station will provide the applicant's power network with an additional 850 MW of electric generating capacity. With an initial capacity factor of 70 percent, the facility would be capable of generating 5.17×10^9 kwh/year of additional energy. The average number of employees and associated payroll

TABLE 1-27

PROJECT SCHEDULE

9/1/78	Receive Certification of Environmental Compatibility and Public Need from New York State Board of Electric Generation Siting and the Environment
2/1/79	Begin equipment procurement.
4/1/79	Start construction - site preparation.
12/1/79	Start foundations.
10/1/80	Start structural steel erection.
6/1/83	First steam to turbine.
10/1/83	Commercial operation.

TABLE 1-28

PERMITS AND LICENSES FOR CONSTRUCTION
AND OPERATION OF THE PROPOSED FACILITY

Permit	Responsible Agency	Activity	Status
Certificate of Environmental Comptability and Public Need (Article VIII)	New York State Board on Electric Generation Siting and the Environment	Construction and operation of power generation facilities	Application Filed
Certificate of Environmental Compatibility and Public Need (Article VII)	New York State Board on Electric Generation Siting and the Environment	Construction of transmission facilities	Application in preparation
State Pollutant Discharge Elimination System	New York State Public Service Commission	Discharge to surface waters	Filed with Article VIII Application
316 (a) demonstration	New York State Board on Electric Generation Siting and the Environment	Discharge of thermal effluent	Filed with Article VIII Application
316 (b) demonstration	New York State Board on Electric Generation Siting and the Environment	Construction of intake structure; intake location, design, and capacity	Filed with Article VIII Application
New Source Review (Prevention of Significant Deterioration)	Environmental Protection Agency	Construction of new stationary source of air pollution	Application in preparation
Department of the Army Permit	Corps of Engineers	Construction of intake and discharge structures on navigable waterway	Permit Application Field
--	U.S. Coast Guard	Establish navigational interference markers	Not applied for as of 6/1/77
Stack Lighting	Federal Aviation Administration	Construction of stack and possibly some transmission structures	Not applied for as of 6/1/77
Section 401 Permit	New York State Board on Electric Generation Siting and the Environment	Water quality standards	Application Filed and Granted

during each year of the construction period and for the first two years of operation are as follows:

Construction Phase

Year	Number of Employees	Payroll
1980	260	$11,060,000
1981	930	42,310,000
1982	1,370	75,880,000
1983	549	23,310,000

Operations Phase

Year	Number of Employees	Payroll
1984	112	$ 4,000,000
1985	112	4,300,000

Estimated property taxes to be paid during each year of construction and for the first year of operation are as follows:

Construction Phase

Year	Property Taxes ($)
1980	1,126,000
1981	2,247,000
1982	3,748,000
1983	4,958,000
1984	5,515,000

At present there are no plans to retire any of the five existing coal-fired plants owned and operated by the applicant.

THE APPLICANT'S CONSULTANTS

1.153
Table 1-29 presents the applicant's consultants and their contributions to the applicant's environmental report.

TABLE 1-29

CONSULTANTS

Organization	Contribution
UNITED ENGINEERS & CONSTRUCTORS INC. 100 Summer Street Boston, Massachusetts 02110	Engineering, air quality impacts, aquatic ecology impacts, noise, and waste treatment
ALDEN RESEARCH LABORATORIES Worcester Polytechnic Institute 30 Shrewsbury Street Holden, Massachusetts 01520	Hydro-thermal modeling
BEUKERS LABORATORIES, INC. 30 Orville Drive Bohemia, New York 11716	Upper-air sounding program
CAROL R. JOHNSON AND ASSOCIATES Landscape Architects - Site Planner 133 Mount Auburn Street Cambridge, Massachusetts 02138	Landscape architects
ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC. 696 Virginia Road Concord, Massachusetts 07142	Air quality and meteorology monitoring
LAW OFFICE OF HUBER, MAGILL, LAWRENCE & FARRELL 99 Park Avenue New York, New York 10016	Review for legal sufficiency
NUS CORPORATION 4 Research Place Rockville, Maryland 20850	Air quality monitoring, aquatic ecology and water quality sampling, land use and socio-economics, and terrestrial ecology
RALPH M. PARSONS LABORATORY FOR WATER RESOURCES AND HYDRODYNAMICS Department of Civil Engineering Building 48-321 Massachusetts Institute of Technology, Cambridge, Massachusetts 02139	Hydro-thermal modeling and water quality analytical models

TABLE 1-29 (Cont'd)

CONSULTANTS

Organization	Contribution
RAYTHEON COMPANY Post Office Box 360 Portsmouth, Rhode Island 02871	Current measurements and shoreline erosion
WESTON GEOPHYSICAL RESEARCH, INC. Post Office Box 550 Westboro, Massachusetts 01581	Seismology
KANE AND CARRUTH, P.C. 70 Memorial Plaza Pleasantville, New York 10570	Transmission route selection and impacts
PRATT AND PRATT ARCHEOLOGICAL CONSULTANTS 1220 Euclid Ave. Syracuse, New York 13201	Archaeological Surveys
INDIVIDUALS	
DR. GEORGE KIERSCH 119 Warwick Place Ithaca, New York 14850	Geology
DR. JAMES M. AUSTIN 36 Wood Street Concord, Massachusetts 07142	Air quality modeling
DR. DONALD R. F. HARLEMAN Ralph M. Parsons Laboratory Department of Civil Engineering Building 48 Massachusetts Institute of Technology 77 Massachusetts Avenue Cambridge, Massachusetts 02139	Hydro-thermal modeling
DR. KEITH STOLZENBACH Ralph M. Parsons Laboratory Department of Civil Engineering Building 48 Massachusetts Institute of Technology 77 Massachusetts Avenue Cambridge, Massachusetts 02139	Hydro-thermal modeling

TABLE 1-29 (Cont'd)

CONSULTANTS

Organization	Contribution
MR. ERIC ADAMS Ralph M. Parsons Laboratory Department of Civil Engineering Massachusetts Institute of Technology 77 Massachusetts Avenue Cambridge, Massachusetts 02139	Hydro-thermal modeling
DR. JAMES HALITSKY 122 North Highland Place Croton-on-Hudson, New York 10520	Air quality

CHAPTER 2 - ENVIRONMENTAL SETTING WITHOUT THE PROJECT

LOCATION

Plant Site

2.001
The Somerset Site is located on the southern shore of Lake Ontario in western New York State, 28 miles northeast of Niagara Falls and 52 miles west-northwest of Rochester. The plant site is at latitude 43°-21'-43"N and longitude 78°-36'-16"W. The site is wholly within the town of Somerset in Niagara County, New York, and consists of 963 acres. The predominant land use within a five-mile radius of the site is agricultural.

Transmission Lines

2.002
The project area for the proposed transmission lines is bounded on the west by New York State Route 78, on the east by the Niagara-Orleans County line, on the south by Tonawanda Creek, and on the north by Lake Ontario. Within the project area, the proposed corridor passes through the towns of Somerset, Hartland, and Royalton. The route for the proposed facilities, the towns through which the facilities pass, and areas of population concentration within the transmission project area are shown on Figure 1-12. The areas through which the proposed transmission lines will pass can be described as rural, and they are projected to remain relatively unchanged. No urban areas will be traversed.

DEMOGRAPHY

Regional Population

2.003
The population "region" as defined in this impact statement includes those counties within a 25-mile radius of the site - i.e., Orleans, Erie, Genesee, and Niagara (county of site).

2.004
The population density for the region was 581.1 persons per square mile in 1970 (as compared to 381.3 persons per square mile for New York State), and 586.8 persons per square mile in 1975 - an increase of one percent.

A complete breakdown of present and projected population densities, by region and by county is presented in Table 2-1. As a region, it

TABLE 2-1

POPULATION DENSITY: PRESENT AND PROJECTED

County	Land Area in Square Miles 1970(1)	Population (Thousands)					Population Per Square Mile					Percent Change in Population			
		Present		Projected(3)			Present		Projected			1970	1975	1980	1990
		1970(1)	1975(2)	1980	1990	2000	1970(1)	1975	1980	1990	2000	1975	1980	1990	2000
Erie	1,058	1113.5	1123.4	1147.0	1214.0	1257.0	1052.4	1061.9	1084.1	1147.4	1188.1	0.9%	2.1%	5.8%	3.5%
Genesee	501	58.7	61.4	64.0	71.0	76.0	117.2	122.6	127.7	141.7	151.7	4.6%	4.0%	11.0%	7.1%
Niagara*	532	235.7	236.4	238.0	241.0	236.0	443.1	444.4	447.4	453.0	443.6	0.3%	1.0%	1.3%	-2.1%
Orleans	396	37.3	38.2	40.0	44.0	47.0	94.2	96.5	101.0	111.1	118.7	2.4%	4.7%	10.0%	6.8%
TOTAL REGION:	2,487	1445.2	1459.4	1489.0	1570.0	1616.0	581.1	586.8	598.7	631.3	649.8	1.0%	2.0%	5.4%	2.9%

*Location of site.

(1) U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population, Volume 1, Characteristics of the Population, Part A - Number of Inhabitants, 1972, PC(1)-A34, New York.
(2) New York State Office of Planning Services, Demographic Projections, Albany, New York, (revised), June 1974.
(3) Article VIII Application, Section 77.2(d)(3)-S.

can be seen that the four-county area can be classified as "high density-urban."

2.005
The major geographic concentration of population in the region is in the Buffalo Standard Metropolitan Statistical Area. The most populous of the cities and towns within this area comprised 62.2 percent of the region's total 1975 population.

2.006
The four-county region experienced its greatest growth, 19.6 percent, in the decade between 1950 and 1960. Individual counties ranged from a high of 27.5 percent for Niagara County to 13.5 percent for Genesee County.

Current (1970) population trends see the population of the region clustered fairly tightly in and around the major cities in Erie and Niagara Counties.

2.007
Between 1970 and 2000, the region is projected to experience an 11.8 percent increase in population, with Genesee County experiencing the highest individual increase of 29.5 percent. The slowest growth is projected to take place in Niagara County, where between 1990 and 2000 there is projected to be a loss of 2.1 percent the change beteen 1970 and 2000 is only +0.1 percent. The projected 1983 resident population for the air quality area of impact is presented in Table 2-2.

Local Population

2.008
The "local area" for population characteristics is being defined in this EIS as the town (Somerset) and county (Niagara) of the proposed station site.

The present (1975) population for the local area is as follows:

Area	Present Population	Percent of Region	Percent of County
Niagara County	236,379	16.2	---
Town of Somerset	2,742	0.2	1.2

2.009
According to the U.S. Bureau of the Census, the town of Somerset would be classified as an urban population (Three Rivers Development

TABLE 2-2

PROJECTED 1983 RESIDENT POPULATION WITHIN 35 MILES OF THE SOMERSET SITE

Direction from Site	Distance from Site (mi)[b]										
	0-1	1-2	2-3	3-4	4-5	5-10	10-15	15-20	20-25	25-30	30-35
NNE	--	--	--	--	--	--	--	--	--	--	--
NE	--	--	--	--	--	--	--	--	--	--	--
ENE	0	0	10	87	14	--	--	--	--	--	--
E	0	0	21	116	134	285	463	865	1,443	2,049	2,508
ESE	0	21	94	667	84	677	2,543	2,369	9,095	2,807[c]	--
SE	0	24	70	291	198	1,206	4,693	5,879	151[d]	--	--
SSE	7	14	138	34	118	829	4,917	2,575	204[d]	--	--
S	3	0	67	37	133	829	3,366	3,768	1,149[d]	--	--
SSW	17	0	46	59	110	1,173	16,905	6,436	502	--	--
SW	0	21	135	37	89	3,900	2,815	5,467	16,069	112,166	68,632
WSW	0	44	79	92	196	3,238	2,310	4,784	12,410	11,582[c]	--
W	--	--	--	--	--	--	--	--	--	--	--
WNW	--	--	--	--	--	--	--	--	--	--	--
NW	--	--	--	--	--	--	--	--	--	--	--
NNW	--	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--

a. Population figures for the projected air quality area of impact at the Somerset Site.
b. Dashes indicate that the sector is outside the air quality area of impact.
c. Impact area extends to 28 miles.
d. Impact area extends to 21 miles.

Foundation, Inc., 1972). However, the New York State Department of Commerce has classified Somerset as rural, and the density of the town further supports a rural classification. In addition, 79.5 percent of the land use in the town is classified as "low intensity," i.e., agricultural, "recreational, natural open-space, etc. Only 1.5 percent is classified as "high intensity,", i.e., industrial, commercial, mining, residential, urban, etc. (N.Y. State Office Planning Services, 1974).

The land area for the town of Somerset is 37.7 square miles. The density of the town was 71 persons per square mile in 1970 and 72.7 persons per square mile in 1975 - an increase of only 2.4 percent. These densities classify Somerset as "high density - rural."

2.010
Current trends (1975) see the population of Niagara County concentrated in and around the major cities, i.e., Lockport, Niagara Falls, and North Tonawanda. These three cities accounted for 60.8 percent of Niagara County's 1975 population.

2.011
The town of Somerset experienced its greatest growth rate, 11.8 percent, between 1950 and 1960. This was an absolute gain of 262 people. Population projections for the 30-year period between 1970 and 2000 for the town of Somerset indicate that the town will experience a 21.3 percent increase in population. The greatest individual increase, 8.2 percent, will occur between 1970 and 1980.

2.012
Population projections for the town of Somerset are shown below:

	1975	1980	1990	2000
Population	2,742	2,869	3,112	3,247
Density (persons/mi.)	—	76.8	82.5	86.1

Source: New York State Office of Planning Services, 1974

2.013
The overall change for Somerset between 1970 and 2000 is 21.3 percent, based on a 1970 population of 2,677. In all projected densities, Somerset will continue to be classified as "high density - rural."

Site - Specific Population

2.014
Approximately 16 houses are located within the site boundaries at this time. Six of these are seasonal dwellings; one is an historically valuable cobblestone house; the remainder are permanently occupied houses. There is a total of approximately 30 occupants who will probably be relocated. Average values of the permanent and seasonal homes are $24,000 and $27,000, respectively. The value ranges represented by the permanent houses are $10,000 to $44,000; the range for the cottages is $14,000 to $38,000. Three individuals farm the land part-time, i.e., as supplemental income. No one is dependent on this income for his sole livelihood.

Existing Capacity of Local Services

Housing

2.015
According to 1970 census data, 1,144 housing units (vacant, for sale, or for rent), or 1.5 percent in Niagara County were unoccupied. The rental vacancy rate for Niagara, as well as nearby Orleans County, was 4.0 percent. In Niagara County, 26 percent of all housing is rural. Within a 20-mile radius of the Somerset Site, there was a total of 7,400 rental units, 322 of which were vacant. The town of Hartland had the lowest vacancy rate (0.62 percent), while the town of Ridgeway in Orleans County (7.5 miles southeast at its closest approach) had the highest vacancy rate (6.94 percent).

These figures do not include houses for sale. There was a total of 147 year-round housing units for sale according to the 1970 census data.

In addition, there is other available housing not indicated in the census data. There are three new mobile home parks under development, each with several hundred units. One is located in Lockport, 13 miles south-southwest, another in Lewiston, 25 miles west-southwest, and the third in Newfane, 7 miles southwest of the station center. Excluding the Niagara Falls area, in 1974 there were 217 available motel units within the environs of the Somerset Site.

Schools

2.016
There are 12 school districts within a 20-mile radius of the Somerset Site. Of these, eight are located in Niagara County. Three school districts are in Orleans County, and the remaining school districts

have students from both Niagara and Erie Counties. The 12 school districts had an estimated 1975 enrollment of 37,460 students. The total potential capacity of all the school districts is 39,997 students.

The current rated capacity refers only to the physical plant, i.e., the physical capacity to accommodate a fixed number of students in each respective school district. Three of the school districts (Wilson Central, Niagara-Wheatfield Central, and Akron Central) are currently operating at or above their current rated capacity.

The table below indicates the enrollment and projected capacities for the schools within the local area of the Somerset Site (NUS, 1976).

School	Location	Distance (miles) from Site	Enrollment (Nov. 1975)	Capacity
Barker Central School District (Elementary, JHS, HS)	Barker	3.5 ESE	1,528	Not Available
Olcott Elementary(K-5)	Burt	6 WSW	287	405
Central Elementary (5-6)	Newfane	7 SW	374	378
Newfane Elementary (K-5)	Newfane	7 SW	693	823
Newfane JHS (7-9)	Newfane	7 SW	725	810
Newfane HS (10-12)	Newfane	7 SW	626	688

Source: NUS Corporation, 1976

There are no other educational facilities (e.g., colleges and universities) within a five-mile radius of the Somerset Site.

Health Facilities

2.017
There are three hospitals within a 20-mile radius of the Somerset Site, with a total of 360 beds. In 1974, these hospitals had a combined average occupancy rate of approximately 82 percent.

According to the New York State Health Department statistics for 1975, Niagara County had one hospital bed per 211 persons, which compares favorably with the New York State average of one bed per 231 persons. However, Orleans County had a considerably lower ratio than the State average, with one bed per 328 persons.

There are no nursing homes, convalescent homes, or sanitariums within five miles of the Somerset Site.

Police

2.018
The immediate environs of the station are served by the New York State Police, the Niagara County Sheriff's Department, and the Orleans County Sheriff's Department. The nearest law enforcement authority is located in Barker, approximately 3.5 miles southeast of the site. The Barker police force consists of one full-time and several part-time employees. The New York State Police Barracks at Wrights Corners, approximately 10.5 miles south-southwest of the site, has a total force of 20 full-time officers, with three to five officers on duty around the clock. In an emergency, they have the capability of calling up additional personnel. The Orleans County Sheriff's Department has a total force of 17 full-time officers, two or three of whom are on duty around the clock. The Niagara County Sheriff's Department has a total force of 148 full-time officers plus eight part-time summer officers. Thirty officers are on duty around the clock.

There is a mutual aid agreement between sheriff's departments throughout New York State, mostly for crowd control. Niagara County, Orleans County, and independent city departments (e.g., those of Lockport, Niagara Falls, and North Tonawanda) call on each other for assistance, exclusive of the mutual aid agreement.

Fire Protection

2.019
A new fire facility is under construction in the village of Barker, 3.5 miles southeast of the station. On completion of this facility, there will be five fire departments within approximately 10 miles of the station. It is estimated that at each fire department there are two pumpers, with a capacity of at least 750 gallons per minute each, and one tanker. In addition, each fire department usually has one smaller pumper, sometimes referred to as a "grass truck." Each fire department has between 50 and 75 volunteer firemen, for a total of approximately 300 volunteer personnel within 10 miles of the station.

2.020
There are 29 volunteer fire departments in Niagara County and city fire departments in Lockport, North Tonawanda, and Niagara Falls. All of these departments have a mutual aid agreement between towns, cities, and adjoining counties (i.e., Genesee, Orleans, and Erie). This mutual aid agreement is controlled throughout the Central Fire Control System, which, for the area of the Somerset Station, is located in Lockport.

The fire facilities within the area of the Somerset Site are given below. All except Hartland have volunteer ambulance service available.

Name of Facility	Location	Distance (miles) and Direction from station
Barker Volunteer Fire Company	Barker	3.5 SE
Olcott Volunteer Fire Company	Olcott	6.0 WSW
Miller Hose Company	Newfane	7.5 SW
Hartland Volunteer Fire Company	Hartland	8.5 S
Wrights Corners Volunteer Fire Company	Wrights Corners	10.5 SSW

Highways

2.021
The regional highway system consists of a network of interstate, State, county, and township highways. This network provides the necessary linkage between the Somerset Site and urban centers from which a large segment of the labor pool involved in the construction of the station will commute. The large urban centers for which these workers will commute are Niagara Falls, Buffalo, North Tonawanda, Irondequoit, Lockport, and Rochester. The main arterials utilized by the construction labor force to obtain access to the immediate environs of the station consist of State Routes 31, 425, 429, 270, 263, 78, 18, 104, and the Lake Ontario Parkway. The traffic generated by the station construction will converge on the immediate environs of the site on two arterial highways, State Route 18 and State Route 104. State Route 18 is an east-west, two-lane arterial that parallels the southern boundary of the site. This State Route has an estimated theoretical two-way capacity at a level of service C of 865 vehicles per hour (vph).

Railways

2.022
Railroad service to the Somerset site is no longer availabe via the Hojack line because of deterioration of the rails and roadbed. The Hojack line connects Niagara Falls with Charlotte (Rochester) and in the vicinity of the site is approximtely two miles south. Rail service was terminated by the New York State Department of Transportation on in early 1978. At this time, NYSE&G is investigating the feasibility of the following alternative routes to provide railroad service to the site:

a. The Hojack line from Niagara Falls to the site.

b. The Hojack line from Rochester to the site.

Both of the above alternative routes roughly parallel Lake Ontario and are located two to four miles inland.

c. A connection from Gasport on the Conrail Falls Road line north to the site would require the construction of approximately 10 miles of new track. The Falls Road line is the main Conrail facility between Niagara Falls and Rochester, and it roughly parallels the Lake Ontario shoreline about 10 to 15 miles south of the lake.

d. A connection between the Hojack line and the Falls Road line in the vicinity of Albion, New York, would require the construction of about five miles of new rail track. The Hojack line would be utilized for the remainder of the distance from the intersection of the new track with the Hojack line to the site.

Sewage

2.023
There are seven sewage treatment plants in the vicinity of the proposed station. Refer to the section on "Water Use" later in this chapter.

Water Supply

2.024
Public water service is presently available at various locations within 20 miles of the Somerset Site. Niagara County has four existing water treatment plants, operated by the cities of Niagara Falls, North Tonawanda, and Lockport, and by the Niagara County Water District. For a complete discussion, refer to the section on "Water Use."

Solid Waste

2.025
There are four operational landfill sites (Wilson, Hartland, Royalton, and Lockport) within 20 miles of the Somerset Site. The nearest site (Hartland) is approximately five miles south of the site. The remaining "lives" of the landfills range from seven to nine years for the Hartland landfill and as high as 16 to 19 years for the Wilson landfill. The town of Somerset has no organized solid waste collection and the village of Barker has municipal controlled collections (NUS Corporation, 1976).

Recreation

2.026
Within a 20-mile radius of the Somerset Site, there are three State parks, a State forest, three county parks, and two municipal parks, as listed below.

Park	Approximate Distance (miles) and Direction from Site	Area (Acres)
Golden Hill State Park	5.5 E	510
Krull County Park	7 SW	323
Canal East County Park	11 S	26
Royalton Ravine County Park	12 S	156
Outwater Municipal Park	13 SSW	42
Wilson Tuscarora State Park	13 WSW	390
Wilderness Municipal Park	14 SSW	30
Tonawanda State Forest	18 SSE	3,462
Lakeside Beach State Park	20 E	734

The guidelines of the National Recreation and Parks Association (1970) recommend a ratio of 10 acres of parks and open-space areas per 1,000 persons. Within a 20-mile radius of the Somerset Site, there is a total of 6,059 acres of parks and open-space areas. As

there are approximately 116,724 permanent residents within 20 miles of the Somerset Site, the parks and open-space figure represents approximately 10 acres per 190 people. This acreage does not include the acreage used for boating facilities and for other water-related recreational activities in the area. An additional 6,038 acres of parks and open-space areas are proposed for future development (Erie and Niagara Counties Regional Planning Board, 1974). On a regional basis, however, it is likely that park and open-space land per capita would be considerably less because of intensive use of these facilities by inhabitants of heavily populated nearby areas such as Buffalo. The 1978 Statewide Comprehensive Outdoor Recreatioin Plan is partially derived from NRPA standards. This plan divides open-space areas into categories such as play lot, neighborhood park, district park, etc., and sets standards of acreage/1,000 population for categories of activity such as hiking, picnicking, skiing, etc. This plan has been developed by the New York State Parks and Recreation Department.

Methodology

2.027
The methodology for determining the projected 1983 population and population density for the air quality area of impact is presented in Section 77.2(d) (5) of the NYS Article VIII Application. Existing data sources, including telephone conversations as appropriate, were used to determine and evaluate the balance of the demographic characteristics.

ECONOMY

Regional Economy

2.028
For the purposes of this section, the Somerset region is being defined as including Niagara County and those counties most likely to experience an economic impact from the station, i.e., the three counties (Erie, Genesee, and Orleans) surrounding Niagara County.

Employment

2.029
Manufacturing is the most important single source of employment in the region, making up 33.7 percent (184,209 people) of the region's employed persons in 1970.

The Erie-Niagara portion of the four-county region is a heavily industrialized area, with major industrial areas concentrated along

Lake Erie and the Niagara River. Heavy industrial development which has a significant impact on surrounding areas is found within the northern and central parts of Niagara Falls, along the Robert Moses State Parkway, in the western portion of Tonawanda, western Lackawanna, Lockport, and along the railroads leading east from the center of Buffalo toward Lancaster. Genesee County, located between the Buffalo and Rochester metropolitan areas, is also industrially oriented.

2.030
The services sector, comprised of business repair services, personal services, professional and related services (hospitals, educational), and entertainment and recreation, accounted for 25.2 percent of the region's employed persons in 1970.

2.031
In 1970, the region's civilian labor force (16 years and over) totaled 590,489 people. The total number of employed workers was 562,612, or 95.2 percent of the civilian labor force.

2.032
In the Somerset region, the manufacturing and service sectors accounted for 67.1 percent of the 1970 employed residents, or 366,645 individuals.

Only 0.5 percent (3,211) of the county residents were employed as farmers or farm managers.

Unemployment

2.033

In 1970, the regional unemployment rate totaled 4.8 percent (28,377) of the total civilian labor force. This rate increased to 7.4 percent (41,300) in 1973 and 8.5 percent (48,900) in 1974.

Income

2.034
In 1969, the average median income for the four-county region for families and unrelated individuals was $8,802 - higher than both the national median ($7,699) and the New York State median ($8,510). The highest individual county median income was Niagara County, $8,978; the lowest was $8652 in Orleans County (N.Y. State Department of Commerce, 1974).

2.035
In 1973, the estimated total personal income for Niagara County was $1,124,700,000. Per capita income was $4,786.

Projected Regional Economy

2.036
Manufacturing can be expected to continue as the basis of the region's economy in terms of both direct employment and income, with the major economic activity anticipated to occur in and adjacent to the major urban areas of the region, especially in Buffalo and Niagara Falls.

2.037
In the Erie-Niagara part of the region, large industrial concentrations are projected in the Tonawandas, the Lackawanna-Southern Buffalo corridor, and the Cheektowaga-Lancaster corridor. A large industrial area is projected in the town of Clarence, located along the outer belt expressway. Industrial development in Niagara County is limited to Niagara Falls and industrial parks in the northwestern section of the county and the city of Lockport. These industrial corridors provide for continuous expansion as regional needs continue to grow (Erie and Niagara Counties Regional Planning Board, 1975). In Orleans County, industrial development and employment is listed as the number one county priority (Genesee/Finger Lakes Regional Planning Board, 1971). The economic development of the region could be enhanced by the foreign trade zone proposed for Niagara County.

Employment Projections

2.038
The manufacturing, services, and trade sectors can be anticipated to continue to provide the greatest percentage of the region's employment. The projected employment for Erie and Niagara Counties by sector is presented in Table 2-3. The manufacturing, services, and trade sectors in Erie and Niagara Counties are projected to comprise 62.8 percent of the employment in 1980, 63.6 percent in 1985, and 64.2 percent in 1990 (Erie and Niagara Counties Regional Planning Board, 1973).

Income Projections

2.039
The income levels for families and unrelated individuals are also projected to increase.

TABLE 2-3

PROJECTED EMPLOYMENT: ERIE AND NIAGARA COUNTIES

	Projected Employment (in thousands)		
	1980	1985	1990
TOTAL JOBS	660.5	686.8	714.0
Erie County	556.7	580.1	604.3
Niagara County	103.8	106.7	109.7
SELF-EMPLOYED, AGRICULTURE, AND DOMESTIC WORKERS	51.0	49.0	47.0
Erie County	41.6	40.0	38.4
Niagara County	9.4	9.0	8.6
MANUFACTURING	188.9	192.2	194.6
Erie County	145.3	148.3	150.0
Niagara County	43.6	43.9	44.6
NON-MANUFACTURING	420.6	445.5	472.4
Erie County	369.6	390.7	415.3
Niagara County	51.0	53.8	57.1
· Contract Construction	34.1	35.7	36.7
Erie County	29.7	30.7	31.4
Niagara County	4.4	5.0	5.3
· Transp. & Public Utilities	35.0	37.8	37.8
Erie County	30.7	33.2	33.2
Niagara County	4.3	4.6	4.6
· Fin., Insurance, Real Estate	21.8	23.1	23.1
Erie County	19.8	21.1	21.1
Niagara County	2.0	2.0	2.0
· Wholesale & Retail Trade	126.3	133.8	142.3
Erie County	110.7	117.2	124.6
Niagara County	15.6	16.6	17.7
· Services & Miscellaneous	99.9	110.7	121.4
Erie County	91.8	101.6	127.5
Niagara County	8.1	9.1	9.4
· Government	102.9	105.9	111.0
Erie County	86.9	89.2	93.5
Niagara County	16.0	16.7	17.5

In the region, the projected distribution of families and unrelated individuals by income level is as follows:

	Percent Distribution				
	1980	1985	1990	1995	2000
Under $5,000	23.1	21.5	20.0	18.5	16.8
$5,000 - $9,999	18.8	16.5	14.9	13.2	12.1
$10,000 - $14,999	24.0	21.3	18.8	15.3	12.5
$15,000 and over	33.9	40.8	46.3	53.1	58.7

Local Economy

2.040
For the purposes of this discussion, the local area is being defined as the county (Niagara) and town (Somerset) of the site.

2.041
Niagara County is part of the heavily industrialized Erie-Niagara region. In 1970, manufacturing accounted for 42.8 percent (37,497) of the County's employment. The principal industrial center is the city of Niagara Falls.

2.042
In 1970, the civilian labor force totaled 92,647 people. A total of 59,069 (63.8 percent) were male and 33,578 (36.2 percent) were female. The total number of employed workers was 87,610, or 94.6 percent of the civilian labor force. In terms of occupation groups, operatives (includes chauffeurs, meat cutters, mine laborers, and welders) accounted for the largest number of employed residents, 23.5 percent (20,588).

Unemployment (Niagara County)

2.043
Niagara County's unemployment rate has consistently been the highest in the four-county region. In 1970, the rate was 5.4 percent increasing to 8.1 percent in 1973, and 9.7 percent in 1974.

Income (Niagara County)

2.044
In 1969, the median income for families and unrelated individuals for Niagara County was $8,978 - higher than the four-county average

median of $8,802 and the New York State median of $8,510. The highest individual municipal median income was $11,791 in the town of Lockport; the lowest was $6,739 in the Tuscarora Indian Reservation (N.Y. State Department of Commerce, 1974).

2.045
A breakdown of the 1970 employment by industry group (sector) for Niagara County and the town of Somerset is presented in Table 2-4.

In 1970, the civilian labor force totaled 977 people, of which 623 (63.8 percent) were male and 354 (36.2 percent) were female. The total number of employed workers was 929, or 95.1 percent of the civilian labor force.

The operatives occupation group accounted for the largest percentage of Somerset's employed labor force, 35.1 percent (326).

Unemployment (Somerset)

2.046
In 1970, the town of Somerset unemployment totaled 48 people, or 4.9 percent of the civilian labor force.

Income (Somerset)

In 1969, the median income for families and unrelated individuals for Somerset was $8,576. When considering the median income for families only, the median increased to $9,700, as compared to $10,203 for the County and $10,617 for the State.

Projected Local Economy

2.048
As part of the heavily industrialized Buffalo Standard Metropolitan Statistical Area (Erie and Niagara Counties), the Niagara County manufacturing sector is projected to continue to account for the largest percentage of employment in the county - 42 percent in 1980, 41.1 percent in 1985, and 40.7 percent in 1990. Accordingly, the operatives, craftsmen, and foremen, and clerical workers occupation groups (the primary groups that service the manufacturing sector) can be expected to account for highest employment percentages.

TABLE 2-4

LOCAL INDUSTRY GROUPS (ECONOMICAL SECTORS) - PERCENTAGE OF EMPLOYED PERSONS - 1970

	LOCATION	
	Niagara (County of Site)	Somerset (Town of Site)
NUMBER EMPLOYED	87,610	929
MANUFACTURING Total	42.8% (37,497)	42.2% (392)
Durable Goods	25.9% (22,691)	30.4% (282)
Non-Durable Goods	16.9% (14,806)	11.8% (110)
WHOLESALE TRADE	2.6% (2,278)	4.4% (41)
RETAIL TRADE	15.5% (13,580)	12.1% (112)
AGRICULTURE	1.7% (1,489)	9.3% (86)
MINING	0.2% (175)	0.0% -
CONSTRUCTION	4.3% (3,767)	5.2% (48)
BUSINESS, REPAIR SERVICES	1.9% (1,665)	0.5% (5)
PERSONAL SERVICES	3.2% (2,804)	0.8% (7)
PROFESSIONAL, RELATED SERVICES Total	16.1% (14,105)	13.3% (124)
Hospitals	3.6% (3,153)	2.3% (21)
Education	7.6% (6,658)	10.0% (93)
ENTERTAINMENT AND RECREATION	0.7% (613)	1.2% (11)
FINANCE, INSURANCE, REAL ESTATE	2.6% (2,278)	2.0% (19)
TRANSPORTATION, COMMUNICATIONS, UTILITIES Total	4.9% (4,293)	7.9% (73)
Transportation	2.5% (2,190)	5.7% (53)
Communications	0.8% (701)	0.5% (5)
Utilities	1.6% (1,402)	1.6% (15)
PUBLIC ADMINISTRATION	3.8% (3,329)	1.2% (11)

The projected distribution of families and unrelated individuals in Niagara County by income level is as follows:

Income Level	Percent Distribution				
	1980	1985	1990	1995	2000
Under $5,000	21.4	20	18.8	17.5	15.9
$5,000 - $9,999	18.7	16	14.3	12.8	11.6
$10,000 - $14,999	26.7	23	20.3	15.9	12.5
$15,000 and over	33.1	40.4	46.6	53.9	59.9

LAND USE

Present Regional Land Use

2.049
The land use "region" is defined in this impact statement as Niagara (county of site), Erie, and Orleans County. A breakdown of the present site-specific, local, and regional land use is presented in Table 2-5.

The present regional land use pattern is one of several large urbanized areas and corridors surrounded by extensive areas of farmland, forest, and other essentially open lands. There is a substantial predominance of agricultural and other open land outside the region's urban centers - Albion and Medina in Orleans County, the Lackawanna-Buffalo-Tonawanda-Niagara Falls corridor in Erie and Niagara Counties, and the city of Lockport in Niagara County.

2.050
Active agricultural land, accounting for 51.3 percent of the region's low intensity land use and 38.1 percent of the total regional acreage, is distributed primarily in Niagara and Orleans Counties. Active agricultural land comprises 47.1 percent of Niagara County's total acreage.

2.051
Open-space lands (includes woodlands, wetlands, water, outdoor recreation, and nonproductive uses), accounting for 56.6 percent of the region's low intensity and nonproductive land uses and 50.0 percent of the total regional acreage, have the largest distribution in Erie County. Open-space lands comprise 42.8 percent of Niagara County's total acreage (New York State Office of Planning Services, 1974).

TABLE 2-5

PRESENT LAND USE: SITE SPECIFIC, LOCAL, AND REGIONAL

Land Use Classification	Site Specific		Local[1] (Town of Somerset)		Regional[2] - 3 Counties	
	Square Miles* (Acres)	Percent of Site	Square Miles* (Acres)	Percent of Town	Square Miles* (Acres)	Percent of Region
High Intensity[3]	0.025 (16)	1.6	0.54 (345.6)	1.4	197.2 (126,277.6)	9.8
Low Intensity[4]	1.49 (954)	98.0	31.11 (19,910.4)	79.5	1,497.4 (958,310.9)	74.3
Corridors and Services[5]	0.006 (4)	0.4	0.12 (76.8)	0.3	48.8 (31,264.1)	2.4
Nonproductive[6]	0	0	7.39 (4,729.6)	18.9	272.6 (174,496.0)	13.5
TOTAL:	1.52 (974)	100.0	39.16 (25,062.4)	100.1	2,016.0 (1,290,348.6)	100.0

* 1 square mile = 640 acres

(1) Calculations based on the 1968 LUNR inventory. Source: New York State Office of Planning Services, LUNR Town Summaries, 1968-1974.

(2) The land use "region" of the Somerset Site has been determined as being three counties: Erie, Niagara, and Orleans.

(3) "High Intensity" includes industrial, commercial, mining, residential, urban, and other land uses involving high development or density.

(4) "Low Intensity" includes agricultural and recreational use, natural open space (wetlands, forest, wildlife refuges), water, and other similar land uses.

(5) "Corridors and Services" includes transportation and communication networks, utilities, and public/semipublic land uses (which includes sanitary landfills and sewage treatment facilities as two components), and others.

(6) "Nonproductive" includes areas of sand and exposed rock cliff, rock slopes and slide areas.

Present Local Land Use

2.052
The "local" area is being defined as the town of Somerset. A breakdown of the town's land use (based on the 1968 LUNR inventory) is presented in Table 2-5. The land use pattern in the town reflects its agricultural character. The residential and commercial development, concentrated in the village of Barker, is surrounded by extensive areas of farmland, woodlands, and other open lands. Active agricultural land accounts for 49.8 percent of the town's acreage, and open-space lands total 48.6 percent of the town's acreage.

Present Site-Specific Land Use

2.053
A breakdown of the present site-specific land use is presented in Table 2-5. The site is devoted primarily to low intensity uses (98.0 percent). The low intensity uses consist specifically of cropland and cropland pasture, inactive agricultural land, forest lands, pasture, and a natural pond. There are 16 acres of shoreline development on the site. Approximately 94 percent of the site is classsified as prime farmland. The following lists the prime soil types found onsite and the approximate acreage for each type.

Soil Type	Percent Slopes	Acreage
Collamer silt loam	0-2 and 2-6	415
Niagara silt loam	0-2 and 2-6	198
Rhinebeck silt loam	0-2 and 2-6	100
Hilton silt loam	0-3 and 3-8	80
Arkport very fine sandy loam	0-6	21
Dunkirk silt loam	2-6	20
Hamlin silt loam	-	18
Claverack loamy fine sand	0-2 and 2-6	17
Hudson silt loam	2-6	10
Hilton gravelly loam	3-8	9
Ovid silt loam	0-2 and 2-6	7
Galen very fine sandy loam	0-2 and 2-6	6
Minoa very fine sandy loam	-	3
Cosad fine sandy loam	-	3
Appleton silt loam	0-3	3
Total		910

There is no unique farmland onsite.

Present Transmission Line Land Use

2.054
Based on the New York State Land Use and Natural Resource Inventory (LUNR), the major land uses in the transmission line project area are active agriculture (54 percent), and inactive agriculture, pasture, and brushlands (36 percent). LUNR data for the specific transmission route proposed by the applicant are contained in Table 2-6. A final route has not yet been selected. The proposed route is located on right-of-way owned by the applicant.

The transmission project area is generally rural in character. Farm landscape, both active and abandoned, predominates, with scattered settlements developed along roadways. About one-third of the active farmland in the project area is devoted to orchards, with concentrations in the vicinity of the Somerset Site and the Gasport area. Although projected development trends indicate increased development along Route 104 and in the Gasport area, the area is expected to remain essentially rural.

Projected Land Use

2.055
Future land use is projected to reflect the national trend towards suburbanization and ruralization. The urban areas and corridors will be fringed by expanding suburban areas set in large areas of farmland and other essentially open lands. There should continue to be a predominance of agricultural and other open land in the region, with Niagara and Orleans Counties continuing to have the primary distribution of the agricultural land. The region as a whole will see an increase in the amount of high intensity land uses as a result of the residential and commercial land use dispersions of suburbanization; an increase in manufacturing/industrial land use can also be expected as regional needs continue to grow.

A map of projected land use for Erie and Niagara Counties is presented in the Erie-Niagara Counties Regional Planning Board Newsletter, Vol. VI, No. 3, June 1975.

2.056
The town of Somerset is projected to have a potentially urbanized area located around the village of Barker in 1990. The town is also considered to have a commercial and residential growth area along Lake Ontario. However, the character of the town should continue to be agricultural and rural.

Table 2-6

LAND USE DATA FOR PROPOSED TRANSMISSION ROUTE

Land Use Category	Miles Crossed	Percent of Total Length
A. High Intensity Uses		
Strip Commercial	0.05	0.3
Barge Canal	0.03	0.2
Recreation	0.34	1.9
	0.42	2.4
B. Low Intensity Uses		
High Intensity Agriculture	0.21	1.2
Cropland	8.21	46.5
Inactive Agriculture	3.03	17.2
Orchards	1.84	10.5
Pasture	0.30	1.7
Forest brush land (less than 30 feet)	2.17	12.3
Forest (greater than 30 feet)	0.78	4.4
Shrub wetlands	0.12	0.7
Wooded wetlands	0.55	3.1
	17.21	97.6

2.057
Although the entire site area of 963 acres will not be developed, the total acreage will fall into the corridors and services category (this category includes utilities). However, the construction and operation of the proposed station may not preclude some recreational development on part(s) of the site; refer to Chapter 3 for a more detailed discussion.

Zoning

2.058
A copy of the applicable zoning map for the area surrounding the site is presented in Figure 2-1. A graphic depiction of the proposed agricultural district for the station area is presented as Figure 2-2.

Site Map

2.059
The general site plan is presented as Figure 1-3. Existing land use patterns in relation to the site are presented in Figure 2-3. A key to the LUNR classification system used in Figure 2-3 is found in Table 2-7.

WATER USE

Recreation

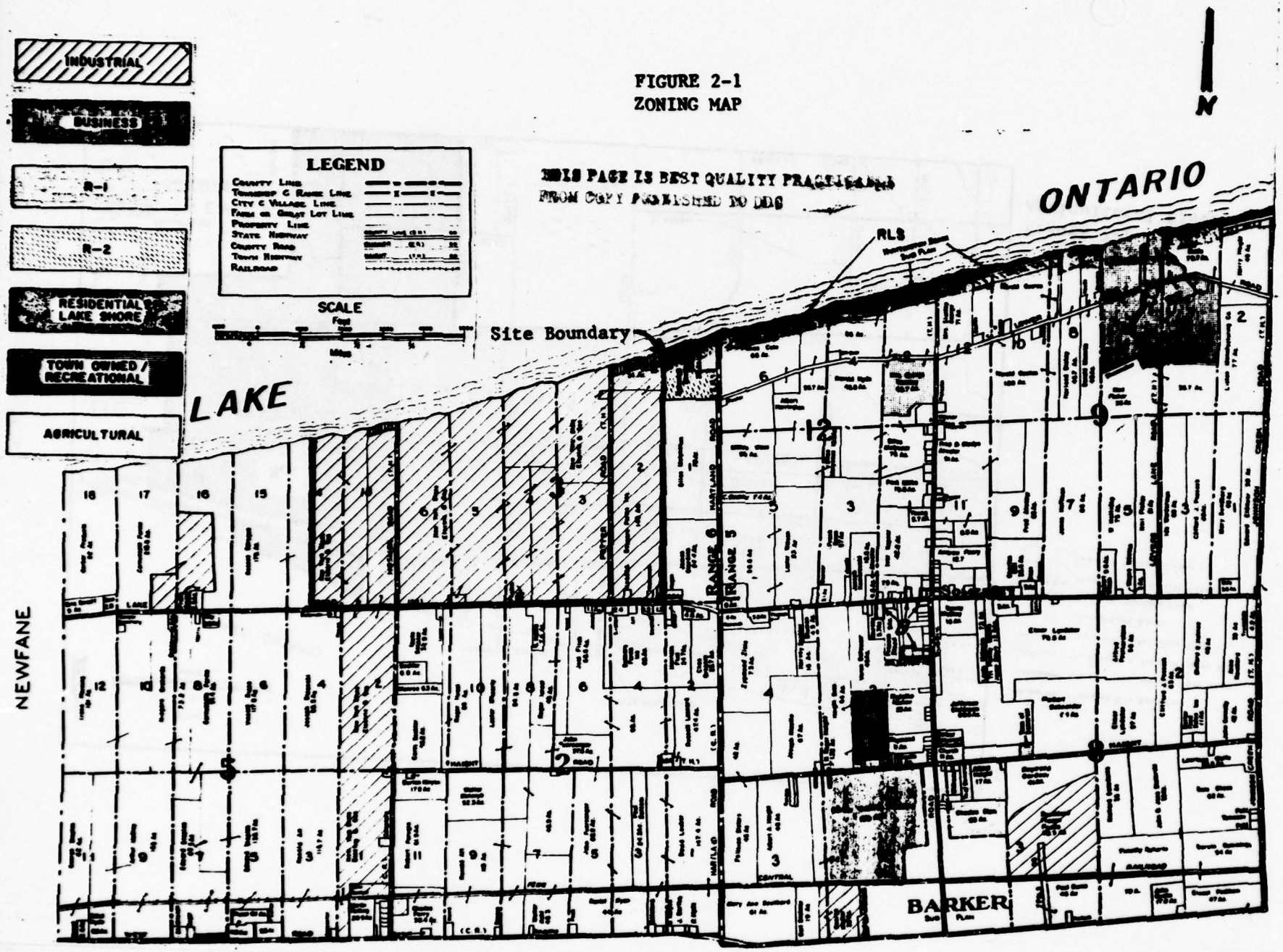
2.060
Lake Ontario, adjacent and to the north of the station, offers recreational activities including swimming, boating, and fishing. In addition, the Erie Barge Canal, 11 miles south of the site, is used primarily for recreation.

2.061
There are no public swimming areas along the lakeshore within the site boundaries. The beach in the region of the site is not conducive to swimming or boating, as the backshore is usually composed of cobblestone which is backed by steep bluffs up to 25 feet high. In addition, swimming in certain sections of Lake Ontario has been discouraged because of pollution problems.

2.062
There are two parks within 10 miles of the site which offer water-related recreational activities. Krull Park, a county park, consists of 329 acres and is located adjacent to Lake Ontario, seven miles westsouthwest of the site. Activities there include fishing, boating, swimming, and picnicking. Estimated attendance per day

FIGURE 2-1
ZONING MAP

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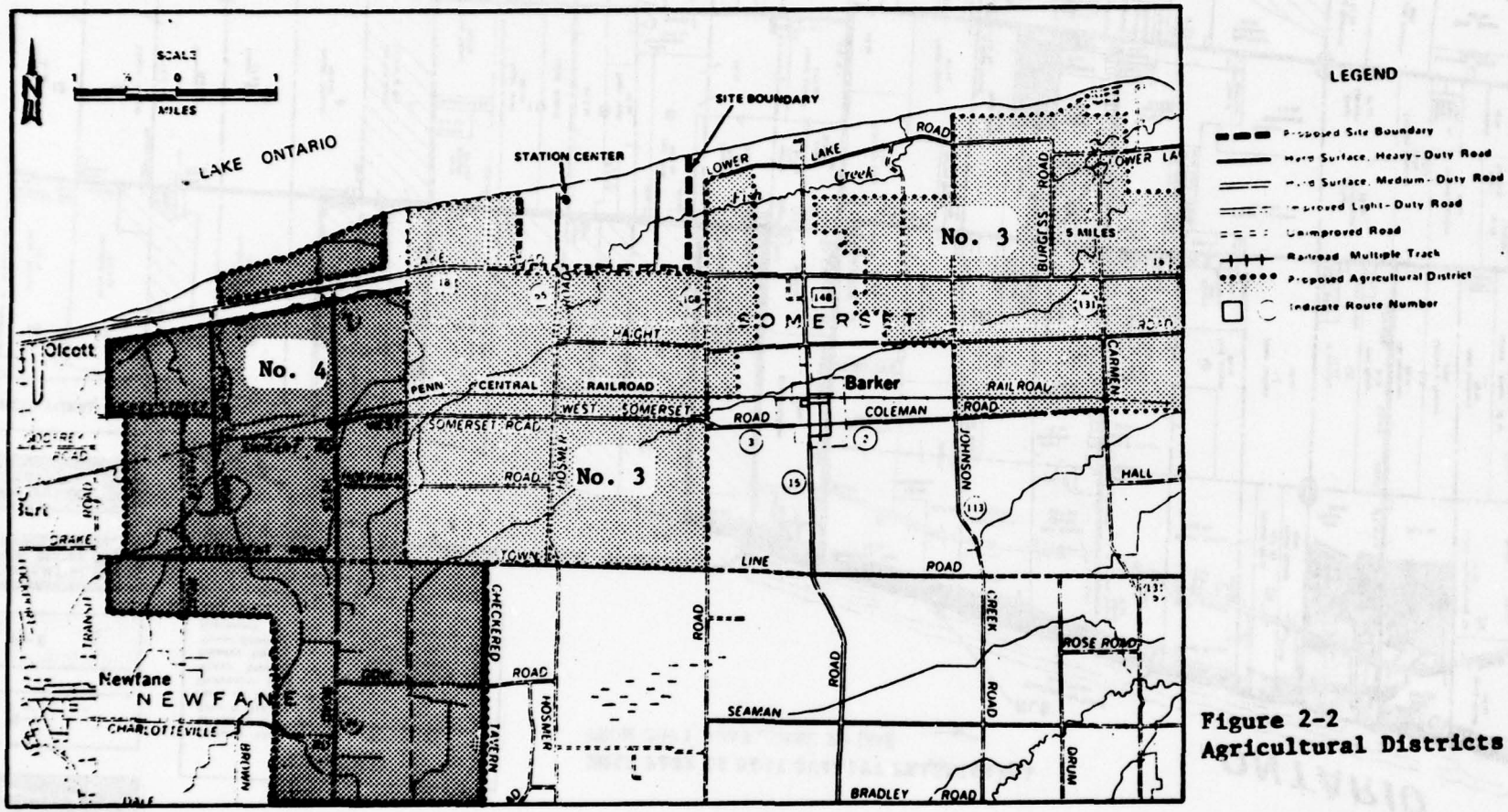


Figure 2-2
Agricultural Districts

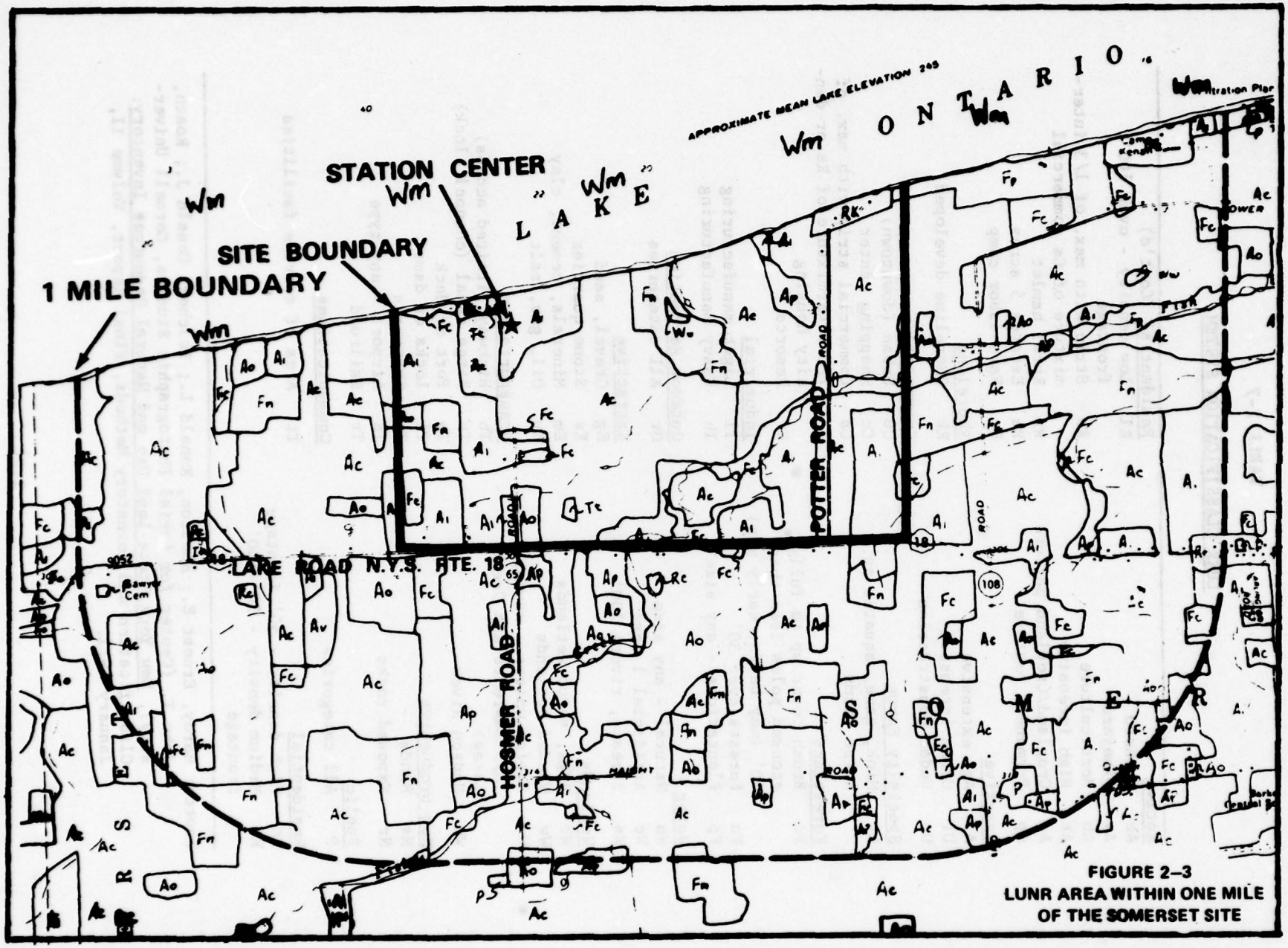


FIGURE 2–3
LUNR AREA WITHIN ONE MILE
OF THE SOMERSET SITE

TABLE 2-7

LUNR CLASSIFICATION SYSTEM

Active
- Ao Orchard
- Av Vineyard
- Ah Horticulture
- At High intensity
- Ac Cropland/Cropland pasture
- Ap Permanent pasture

Inactive
- Ai Ag. extensive
- Ui Urban intensive
- Uc Under construction

Specialty Farms
- Ay Mink, game, aquatic ag., horse farms

Forestland
- Fc Brush cover up to fully stocked poles less than 30' (may be Fb, early map)
- Fn Forests over 30'
- Fp Plantations - any size

Water
- Wn Natural - any size
- Wc Artificial 1 acre
- Ws Streams, rivers 100'

Wetlands
- Wb Bogs, shrub wetlands
- Ww Wooded Wetlands
- Wm Marine waters - navigable (St. Lawrence and Great Lakes)
- Wh Hudson River

Non-productive
- Ns Sands
- Nr Exposed rocks

Public
- P All categories

Residential
- Rh High density - 50' frontage
- Rm Medium density - 50'-100' frontage

Residential (Cont'd)
- Rl Low density - over 100' frontage
- Rs Strip with max. of 1/3 intermixture of Cs commercial
- Rr Rural hamlet
- Re Estates 5 acres
- Rc Farm labor camp

Shoreline
- Rk Shoreline developed

Commercial
- Cu Urban (downtown)
- Cc Shopping center
- Cs Commercial strip with max. of 1/3 intermixture of Rs or density housing
- Cr Resorts

Industrial
- Il Light manufacturing
- Ih Heavy manufacturing

Outdoor Recreation
- Or All categories

Extractive
- Eg Gravel, sand
- Es Stone quarries
- Em Minerals, cement, clay
- Eu Oil, gas, salt

Transportation
- Th Highway (limited access)
- Tb Barge canal (channel, lock)
- Tp Port or deck
- Tl Locks or dams
- Ts Shipyards
- Ta Airport - any type
- Tr Railroad

Communications
- Tt Area of service facilities

Source: Hardy, Ernest E.; Shelton, Ronald L.; Belcher, Donald J,; Roach, John T. (Center for Aerial Photographic Studies, Cornell University), New York State Land Use and Natural Resources Inventory: Classification and Inventory Methods, Final Report, Volume II, January 1971.

during the summer months is 300 to 500 on weekdays, 2,000 to 3,000 on weekends, and up to 5,000 on holidays. Fishing activity may begin as early as March.

The other, Golden Hill State Park, consists of 510 acres and is located adjacent to Lake Ontario, six miles east of the station center. Activities include boating, fishing, camping, and picnicking. Approximately 4,700 people used this park from 1 April 1973 to 31 March 1974.

In addition to these parks, Camp Kenan, A YMCA facility for underprivileged children, is approximately two miles east-northeast of the station center. The camp consists of approximately 52 acres and accommodated 475 children and 45 employees from 1 July to 15 August 1974.

2.063
Although there are presently no conservation areas near the site, a proposed wetlands area may be developed in Hartland Swamp, approximately five miles south of the site. This proposed 700-acre tract is expected to eventually consist of a waterfowl and game preserve as well as controlled hunting lands. The State DEC will obtain parcels as they become available for purchase from present landowners, and has already acquired approximately 120 acres east of the proposed route.

2.064
Marinas at Olcott, six miles west of the site, and Point Breeze, 21 miles east of the site, have the largest docking facilities in the area. On weekends during the warmer months, an estimated 150 to 200 boats per day use these marinas. There are several small marinas between Olcott and Point Breeze, with additional private docks throughout the area.

2.065
The major angling species taken from Lake Ontario by sportsmen include brown trout, rainbow trout, coho and chinook salmon, smallmouth bass, yellow perch, brown bullhead, northern pike, rock bass, bluegill, largemouth bass, walleye, and black crappie. The State of New York stocks salmonids such as coho and chinook salmon, and programs of lamprey control have improved the salmonid fishery. The State of New York had placed a ban on fishing in Lake Ontario due to contamination of the waters with Mirex, but the ban has since been replaced with a warning.

Although the New York State Barge Canal is polluted at certain points, it forms a productive warm-water fishery habitat. Fishing in the canal is open to the public.

Water Supply

Niagara County

2.066
There are presently four water treatment plants in Niagara County, which serve about 90 percent of the population. These plants are operated by the cities of Niagara Falls, North Tonawanda, and Lockport, and by the Niagara County Water District (NCWD).

The NCWD also serves portions of Orleans County, including the village of Medina and its environs, Miller and County Line hamlets, and the town of Shelby, as well as the northern half of Grand Island in Erie County. The NCWD withdraws water from the West Branch of the Niagara River. In 1974, the average daily withdrawal was 12.5 mgd. Of this, approximately 20 percent was used by industry and 80 percent by residential customers. The water system serves approximately 87,000 people. During the summer, an estimated two mgd is used for irrigation.

The water demand of those served by the NCWD is increasing. The NCWD can, however, purchase an additional supply of potable water, as needed, from the city of Niagara Falls, thus increasing the capacity of the system to 24 mgd. (Vanderbeck, 1977)

2.067
Based on an estimated 100 gpd per capita, it is estimated that by 1980 an average 15.5 mgd of water will be required, with a peak rate of 31 mgd. To meet this requirement, the NCWD is currently conducting a study on filtration in order to double the amount of water they presently filter. This project should be completed in 1978. (San Giacoma, 1977) (Vanderbeck, 1977)

Until 1980, Niagara County will be supplied by water pumped from the Niagara River. After the construction of a planned water treatment plant near Olcott in 1980, however, the area north of the Niagara Escarpment may obtain most of its water from Lake Ontario. The water treatment plant will have a capacity of six mgd. In addition, during this time period, a plant will also be built at Youngstown and will have a capacity of four mgd. (Greeley and Hanson, 1970)

Orleans County

2.068
The public water supply system in Orleans County served an estimated 17,300 people in 1969. About one-half of the county's demand in 1969 was met by local utilization of Lake Ontario as a water source. The

remainder of the public water supply was obtained from wells and from water districts outside the county.

A general guide of 85 gpd per capita is used in determining the demand for potable water in Orleans County for the year 1980. (Asgeirsson, 1975)

Lake Ontario is the source of supply for the municipally owned Lyndonville water system. The water treatment plant has a rated capacity of 0.20 mgd and had an average daily withdrawal of 0.10 mgd in 1974. Ninety percent of this was used by residential customers and 10 percent by industry. The Hamlets of Yates Center and Shadigee are supplied by taps on the Lyndonville supply line. The plant served an estimated population of 2,222. Lyndonville will have to expand its facilities in order to meet its projected demands. (Orleans County Planning Board, 1974).

Local Area

2.069
A 20-mile radius was chosen as the area of impact for workers relocating into the region of the Somerset Site. This radius was used in general throughout this section as a means of determining regional impact.

2.070
Figure 2-4 indicates the existing and proposed water supply facilities for the region surrounding the Somerset Site.

The region within 20 miles of the site obtains water from the city of Lockport, the Niagara County Water District (NCWD), the village of Lyndonville in Orleans County, and private wells. Lockport draws its drinking water from the Niagara River near North Tonawanda Island. In 1973, the average daily withdrawal was 12 mgd. Of this, 78 percent was used by industry, and 22 percent was used by residential customers. The water system serves approximately 26,000 people, and is presently being updated, particularly the water lines. An estimated 80 gpd of water per capita is used to project future capacities. (Laufer, 1977)

2.071
In the immediate area, an eight-inch water main on Lake Road is the closest main to the Somerset site, and runs parallel to the shoreline of Lake Ontario at a distance of approximately 5,000 feet from shore. The estimated pressure in this line is 70 to 85 psi. In addition, a six-inch water line on Quaker Road extends perpendicular to the shoreline, approximately 6,500 feet from the site boundary on the east.

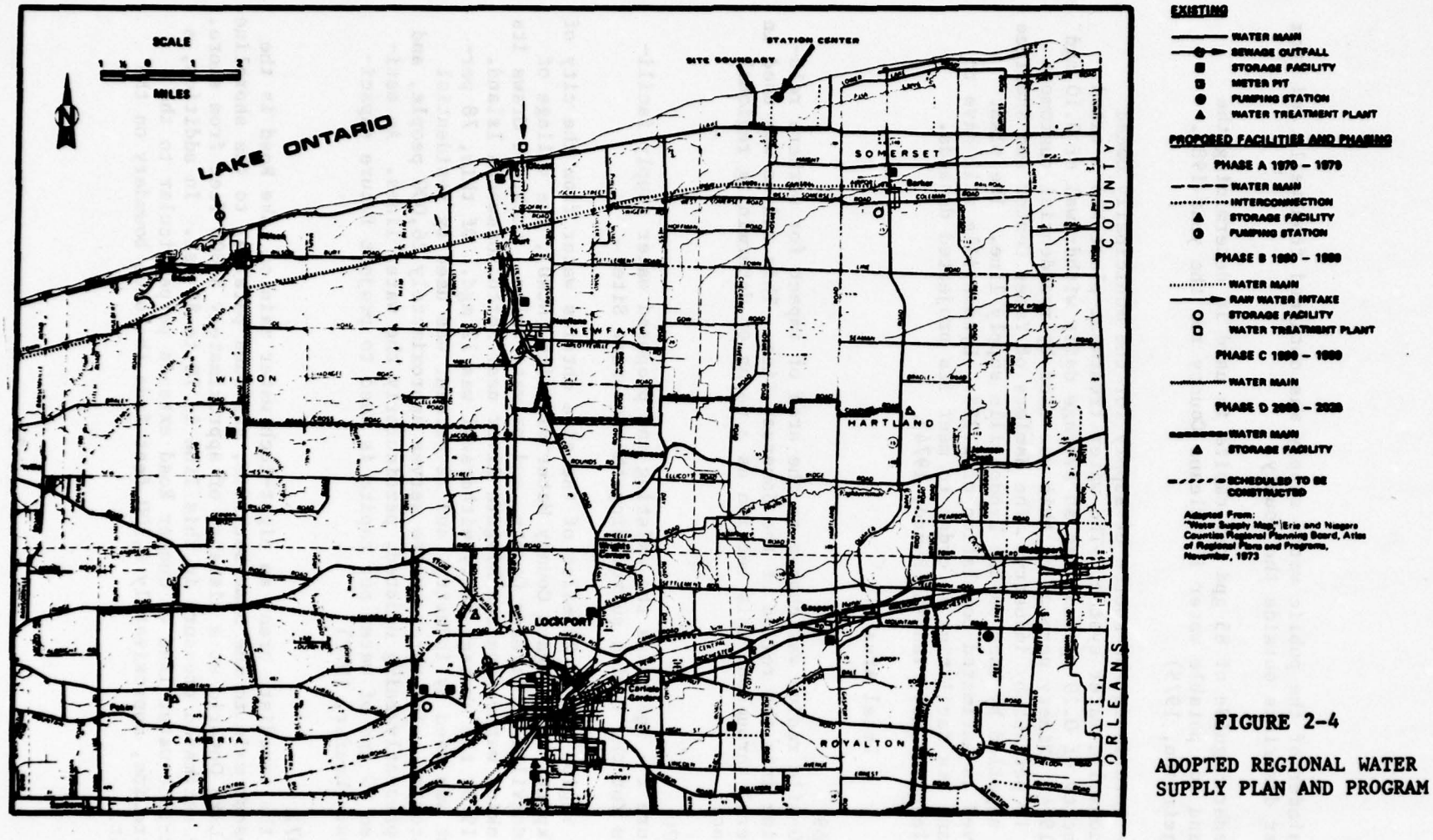


FIGURE 2-4

ADOPTED REGIONAL WATER SUPPLY PLAN AND PROGRAM

2.072
A water line 24 inches in diameter is proposed for 1977 to serve Somerset, Wilson, and the southern parts of Newfane. Cambria, Hartland, and Barker will be served by a 12-inch water line to be built in 1979. Two pumping stations are under construction in Wheatfield which will help alleviate problems in volume and pressure occurring in Newfane, Cambria, and Somerset. (San Giacoma, 1977)

2.073
Table 2-8 and Figure 2-5 describe the water wells within a two-mile radius of the site. These wells were inventoried in the fall of 1973, and range in depth from 13 to 60 feet. Although a few tap only the perched water in the overburden, the majority tap either the main groundwater reserve in the Queenston formation or both the overburden and the Queenston sources. Nearly one-third of the 73 wells inventoried are drilled wells, while the rest are dug wells three to four feet in diameter. It was determined from discussions with well owners and local well drillers that well yields in the area are generally low, ranging from 1 to 20 gpm, with the average less than five gpm.

Of the 73 wells inventoried, only 39 are currently being used, 29 as domestic wells and 10 as stock wells either for livestock or for watering gardens. The estimated average daily pumpage from these wells is about 10,000 gallons. A cross section of the site showing groundwater elevations is presented in Figure 2-5A.

Local Water Consumption

2.074
The major industry in the nearby environs of the Somerset site is Southland Frozen Foods, Inc., located in the village of Barker. From June 1970 to June 1971, Southland used approximately 107 million gallons of water for process water and cooling water and for domestic use at two adjacent migrant worker camps. Water is purchased from the Niagara County Water District.

In the region surrounding the Somerset site, water used for irrigation is supplied by the Niagara County Water District or by private wells. Between 500 and 1,900 acres of land were irrigated in Niagara County and in Orleans County in 1968. The Barge Canal is also used to some extent for irrigation purposes. Lake Ontario is not used as a water source for irrigation in this area.

Water for livestock is obtained from the Niagara County Water District or from private wells.

TABLE 2-8

PRIVATE WATER SUPPLIES WITHIN 2 MILES OF THE SOMERSET SITE

Well No.	Water Use	Number of People Relying on Well for Water	Number of Livestock Watered	Estimated Average Daily Pumpage* (gpd)
1	D	4	0	300
2	D	4	0	300
3	U	0	0	0
4	UL	0	0	0
5	D	4	0	300
6	S	0	17 beef cattle	200
7	U	0	0	0
8	D	3	0	225
9	UCo	0	0	0
10	UCo	0	0	0
11	UCo	0	0	0
12	UCo	0	0	0
13	S	0	3 cows; & waters garden	100
14	UCo	0	0	0
15	UCo	0	0	0
16	S	0	5 beef cattle	60
17	UCo	0	0	0
18	UCo	0	0	0
19	D	3	0	225
20	S	0	60 cows	1200
21	D	2	0	150
22	D	5	0	375
23	D	5	0	375
24	D	2-4	0	90 (cottage used weekends only)
25	D	2	0	60 (cottage used weekends only)
26	UCo	0	0	0
27	UCo	0	0	0
28	UCo	0	0	0
29	UCo	0	0	0
30	UCo	0	0	0
31	UCo	0	0	0
32	S	0	5 pets; & waters garden	50
33	S	0	1 cow	20
34	UCo	0	0	0
35	A	0	0	0
36	S	0	4 cows; 2 ponies	100
37	D	7	15 beef steers	705
38	U	0	0	0
39	A	0	0	0
40	D	2	0	150
41	D	4	0	300
42	D	3	0	225
43	D	5	0	375
44	D	0	0	0
45	D	3	30 dairy heifers	585
46	D	2	0	150
47	D	2	0	150
48	S	0	12 beef cattle	150
49	D	6	0	450
50	D	4	2 horses	320
51	D	2	10 horses	250
52	D	2	0	150
53	D	2	0	150
54	U	0	0	0
55	D	12-15	0	1050
56	UL	0	0	0
57	UCo	0	0	0
58	UCo	0	0	0
59	D	4	0	300
60	S	0	2 cows	40
61	D	1	0	75
62	U	0	0	0
63	D	3**	0	20
64	D	1	0	75
65	A	0	0	0
66	UCo	0	0	0
67	S	0	Used for spraying	20
68	UCo	0	0	0
69	UCo	0	0	0
70	UCo	0	0	0
71	UCo	0	0	0
72	UCo	0	0	0
73	UCo	0	0	0

* Assumes 75 gpd (gallons per day) per person
20 gpd per dairy cow
12 gpd per beef steer or dairy heifer
10 gpd per horse

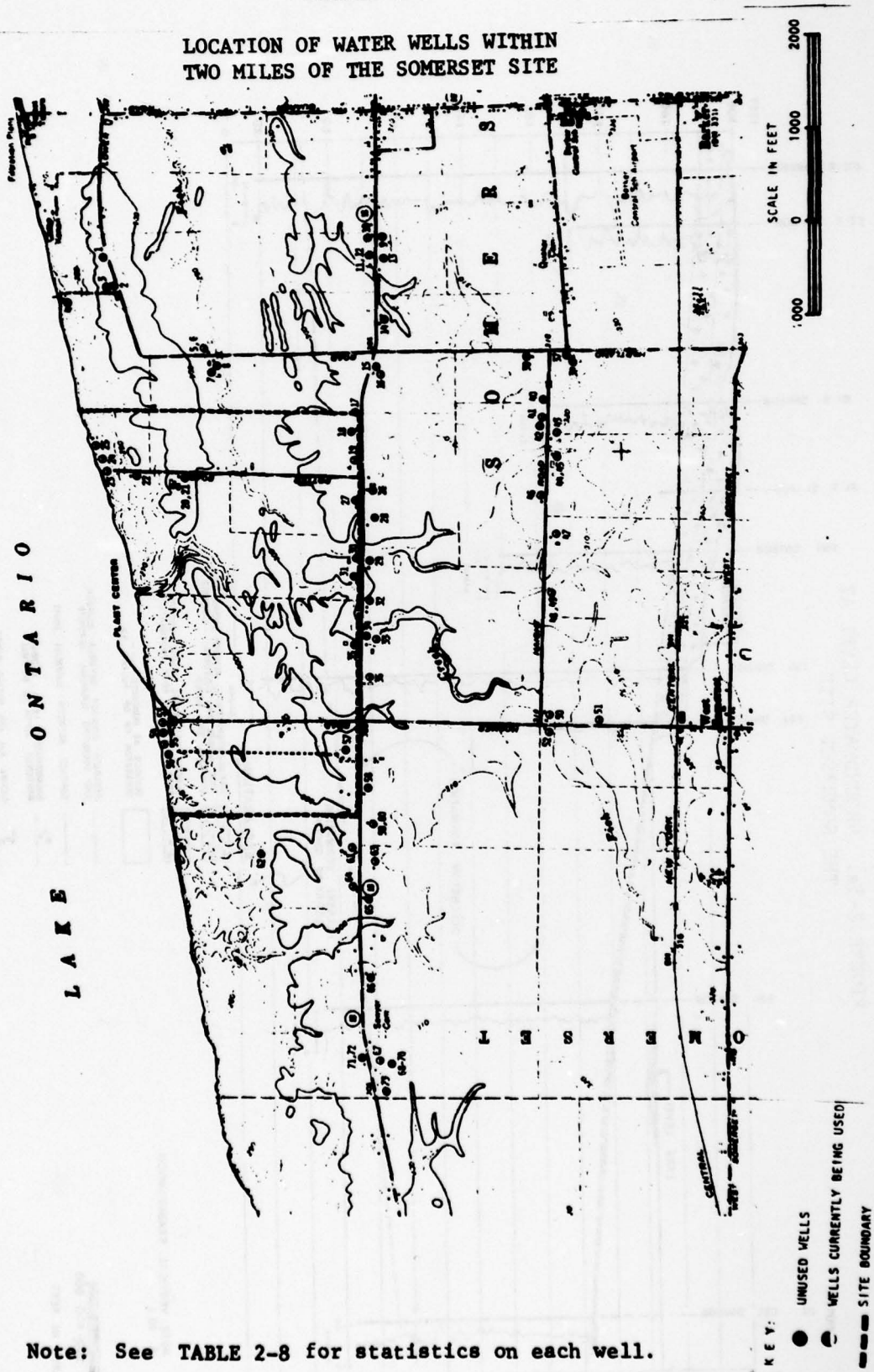
**Only off and on; no house yet.

KEY: D = Domestic Use
S = Stock Use
A = Abandoned
U = Unused, water obtained from another well
UCo = Unused, water obtained from Niagara County Water District
UL = Unused, water obtained from Lake Ontario

(Refer to Figure 2-5 for location of wells.)

FIGURE 2-5

LOCATION OF WATER WELLS WITHIN
TWO MILES OF THE SOMERSET SITE



Note: See TABLE 2-8 for statistics on each well.

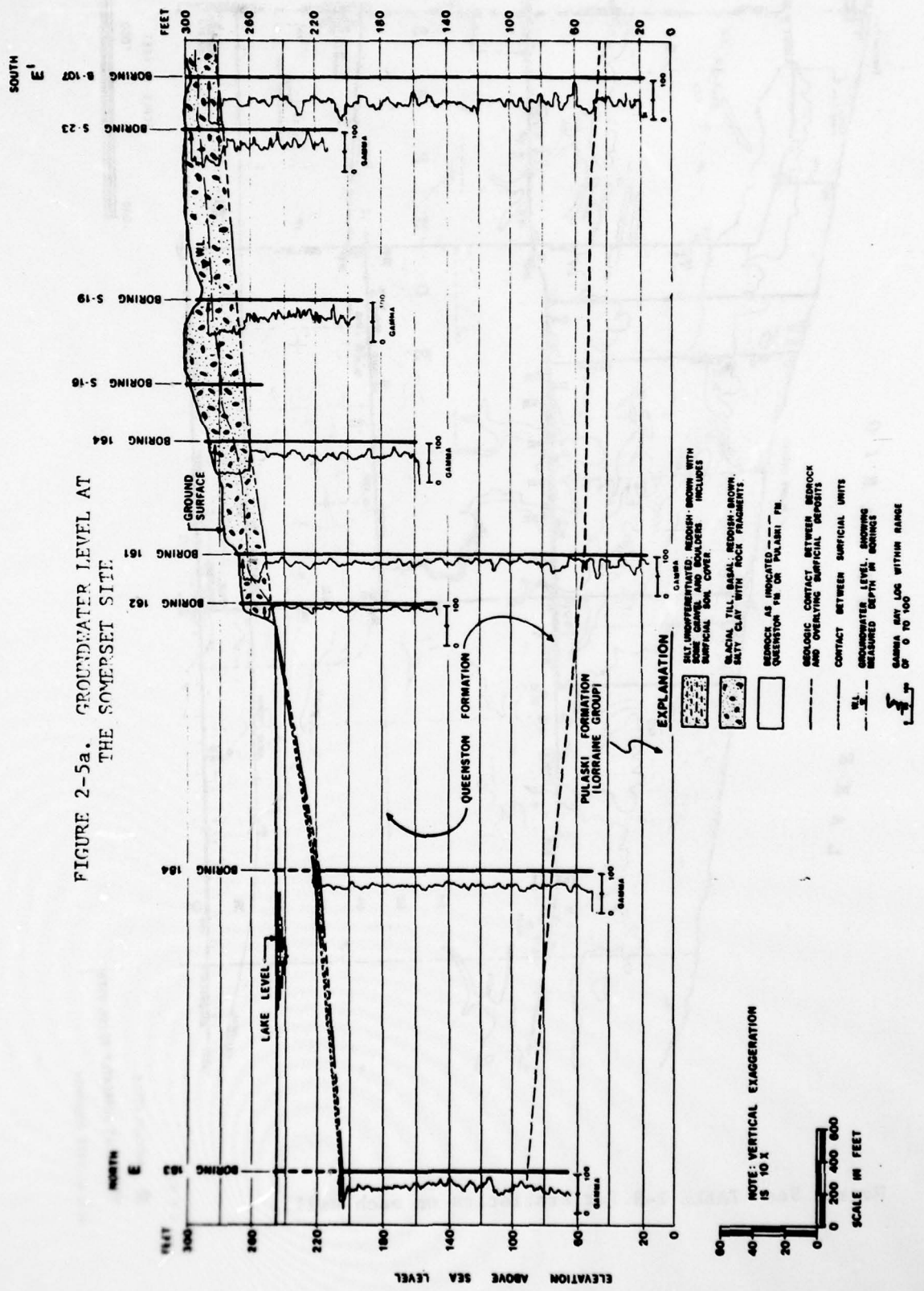


FIGURE 2-5a. GROUNDWATER LEVEL AT THE SOMERSET SITE

Comercial Navigation

2.075
During the months when the St. Lawrence Seaway is open (usually April through December), over 8,000 vessels can be expected to pass within 5 to 40 miles of the Somerset site. Tankers passing through Lake Ontario remain in the deeper channels, the nearest of which is 5.25 miles north-northwest of the site.

The only commercial harbor of significance near the site is Rochester, NY. In 1976, this harbor handled 210,666 tons of commodities, most of which was building cement. The Erie Barge Canal, located 11 miles south of the site, was originally constructed for commercial purposes. Today, however, the canal is used mainly for recreational boating. In 1977, the cargo shipped on this section totaled 614,841 tons.

There are no ferry services or other major water transportation services in the vicinity of the Somerset site.

Commercial Fishing

2.076
The commercial catch in Lake Ontario has declined substantially in recent years, and there are no commercial fishermen working Lake Ontario (U.S. waters) on a regular basis. There is no commercial fishing near the Somerset site. Chaumont Bay which is at the eastern end of Lake Ontario yields more than half of the total U.S. commercial catch. Historically, Lake Ontario supported catchable populations of commercial fishes such as Atlantic salmon, lake sturgeon, lake whitefish, blue pike, lake herring, and ciscoes.

Waste Disposal

2.077
The only significant industrial contributor of waste within the nearby environs of the Somerset site is Southland Frozen Foods, located approximately three miles southeast in the village of Barker. Southland utilizes seven in-series lagoons for treatment of its waste prior to discharge into Golden Hill Creek. The combined volume of the seven lagoons is 17.8 million gallons (computed from 1971 data supplied by Southland).

2.078
There are presently four public sewage treatment plants operating within a 20-mile radius of the site: Lockport and Middleport in Niagara County, and Lyndonville and Medina in Orleans County.

2.079
The plant in Lockport has the capacity to treat 22 mgd of sewage. The average daily flow of sewage to the treatment plant was 10 mgd in 1974. The Middleport plant has the capacity to treat 0.7 mgd of sewage, and currently releases the treated effluent into Tedda Creek. The average daily flow in 1974 was 0.15 mgd.

2.080
The sewage treatment plant in Lyndonville has a capacity of 0.1 mgd and had an average daily flow of 0.08 mgd in 1974. The plant effluent is discharged into Johnson Creek. The present treatment plant consists of a covered septic tank. Both treatment and collection systems date back to 1922 and have been poorly maintained. In February 1967, Lyndonville was served with orders to abate pollution. The village is currently in the process of improving existing facilities which would provide a capacity of 0.4 mgd in 1977, as well as approximately 10,000 linear feet of trunk sewers to carry industrial and domestic wastes.

2.081
The Medina plant had an average daily flow of 1.8 mgd in 1974 and served a population of 6,710 people. The system has a current rated capacity of 2.4 mgd and provides primary treatment only. The capabilities of the system are restricted because the collection system is combined with storm flows, resulting in the diversion of untreated waste directly into Oak Orchard Creek and the Erie Barge Canal during storms. Effluent from the treatment plant, as well as some industrial waste, is discharged to Oak Orchard Creek downstream from the Glenwood Dam. There are also small areas within the district not served by public sewer. It has been recommended that, where practical, the unsewered areas should be tied into the collection system. Provisions for further treatment of effluent before release have also been recommended, as water quality deterioration problems have been noted in Old Orchard Creek. (Orleans County Planning Board, 1974)

2.082
A factor of 75 to 100 gpd per capita is used by the Erie and Niagara Counties Regional Planning Board to estimate the number of people a wastewater treatment plant can serve if functioning at its rated capacity. For Orleans County, the Genesee/Finger Lakes Regional Planning Board uses 85 gpd per capita as a general guide in determining the flow of sewage for 1980. The production rate of sewage per person is estimated to increase one gallon per day per year, to 95 gallons in 1990. (Asgeirsson, 1975)

2.083
Those parts of Niagara and Orleans Counties that do not utilize public sewer systems, including the area of the Somerset site, must rely on septic systems or alternatives. The suitability of soils in Niagara County is rated marginal to poor for the installation of septic systems. (Devald, 1976) The majority of the soils in Orleans County is rated good to fair.

2.084
The Erie and Niagara Counties Regional Planning Board and the Genesee/Finger Lakes Regional Planning Board have proposed comprehensive sewage plans for their respective counties. These plans only recommend locations for new facilities; construction is dependent on the approval of State and Federal regulatory agencies. Table 2-9 indicates present and planned sewage treatment facilities for Niagara and Orleans Counties and their projected capacities for 1980.

2.085
In Niagara County, the town of Newfane has been ordered by the New York State Commissioner of Health to abate raw sewage discharges to Eighteenmile Creek and Lake Ontario. The Hamlet of Newfane's existing Sewer District No. 1 is under orders to provide adequate secondary treatment facilities. The Hamlet of Olcott has many properties which discharge their sanitary sewage into storm drainage facilities which in turn discharge into surface waters. The village of Barker is under orders from the State Commissioner of Health to cease its pollution of Golden Hill Creek, although these orders have not been enforced as the village has taken all possible steps to provide adequate, economical treatment of the wastes. (Wendell Associates, 1974)

Construction of five sewage treatment facilities has been recommended by the Erie and Niagara Counties Regional Planning Board. These will be located in Wilson, Newfane, Porter, Wolcottsville, and Somerset. Construction of a plant has also been proposed by Niagara County for the area surrounding the Somerset site.

The planned completion date of the Wilson treatment plant is 1980, and it will have a rated capacity of 0.80 mgd. The treatment plant in Newfane has been approved and funded, and will have a capacity of 1.6 mgd when completed in 1977 or 1978. The treated effluent will be discharged into Lake Ontario. The treatment plant in Porter will, if constructed, have the capacity to treat 1.1 mgd of sewage, and will discharge the effluent into Lake Ontario. The treatment plant in Wolcottsville has not been funded, but would have a capacity to treat an estimated 0.06 mgd of sewage. The treated effluent would be discharged into Mud Creek.

TABLE 2-9

PROJECTED 1980 CAPACITIES OF SEWAGE TREATMENT FACILITIES WITHIN THE NEARBY ENVIRONS OF THE SOMERSET SITE

Sewage Treatment	City, Town or Village Served	1980 Population Projection	Rated 1980 Plant Capacity (mgd)
	Niagara County		
Somerset[a]	Somerset	2,130	0.87
	Barker	590	
Newfane[a]	Newfane	9,920	1.60
Wilson[a]	Wilson (town)	3,950	0.80
	Wilson (village)	1,140	
Porter[a]	Porter	8,430	1.10
Lockport	Lockport (city)	27,900	22.00
	Lockport (town)	9,580	
Wolcottsville[a]	Royalton	500	0.06
Middleport	Middleport	2,425	0.06
Niagara County Sewer District 1	Pendleton, Lockport (town), Cambria, Niagara, Wheatfield, Lewistown	4,990	6.00
	Orleans County		
Lyndonville	Lyndonville	N.A.[b]	0.4
Medina	Medina	6,710	2.4

a. Proposed facilities; not yet operating.

b. Indicates information not available.

2.086
The proposed Somerset-Barker Sewer District will comprise the village of Barker and a portion of the town of Somerset. The sewage treatment facility will be located at the intersection of Lower Lake Road and Quaker Road. The proposed district does not include the Somerset site, however, as the extreme western border of the district is approximately 9,000 feet from the site.

The system proposed would have the capability of providing collection and secondary biological treatment of up to 0.87 mgd, 0.02 mgd of which is domestic waste and infiltration and 0.60 mgd is industrial waste (contributed mainly by Southland Frozen Foods). The system has been approved and funded, and is scheduled to be operational in late 1977.

The treated effluent will be discharged into Lake Ontario at a point far enough from the shoreline and at a depth great enough so that the lake will be able to assimilate the waste load. It is assumed that at the point of discharge the waste waters will be captured by prevailing lake current flows, which would allow for dilution. Consequently, the effect of the return flow of the waste waters to the surface and the shoreline would be negligible.

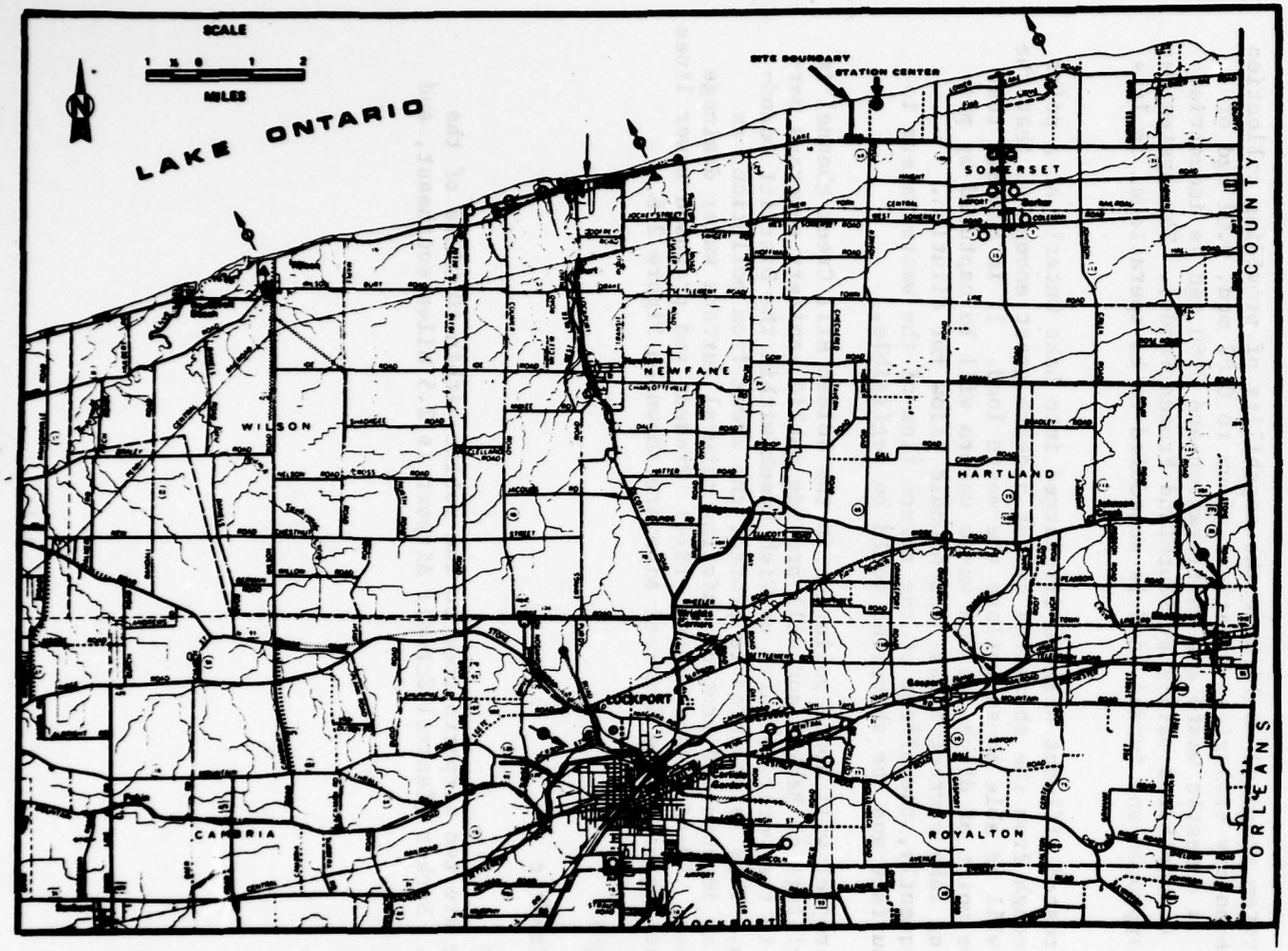
The project will abate pollution in the Golden Hill Creek channel in the village of Barker and will provide public sanitary sewerage service to the watershed area of Fish Creek within the District boundaries. This is expected to protect the creek from pollution, as well as improve and protect existing natural surface water drainage courses. (Wendell Associates, 1974) Present and proposed sewer lines in the region of the Somerset site are shown on Figure 2-6.

AIR USE

Air Traffic

2.087
There are two airports open to the public within 10 miles of the site. Barker (Central School) Airport is 2.5 miles southeast, and

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LEGEND

- REGIONAL BOUNDARY
- SUB-REGIONAL BOUNDARY
- TRIBUTARY AREA BOUNDARY

EXISTING

- SANITARY FORCE MAIN
- SANITARY INTERCEPTOR
- SEWAGE OUTFALL

PROPOSED FACILITIES AND PHASING

PHASE A 1970 – 1979

- SANITARY TRUNK SEWER
- SANITARY FORCE MAIN
- PUMPING STATION
- NEW OR ENLARGED TREATMENT PLANT
- TREATMENT PLANT TO BE ABANDONED
- SEWAGE OUT FALL

PHASE B 1980 – 1989

- SANITARY TRUNK SEWER
- SANITARY FORCE MAIN
- PUMPING STATION
- RAW WATER INTAKE

PHASE C 1990 – 1999

- SANITARY TRUNK SEWER

PHASE D 2000 – 2[illegible]

- SANITARY TRUNK SEWER
- SANITARY FORCE MAIN
- PUMPING STATION

Adapted From:
"Regional Sanitary Sewerage Map", Erie and Niagara Counties Regional Planning Board, Atlas of Regional Plans and Programs, November, 1973

FIGURE 2-6

ADOPTED REGIONAL SANITARY SEWERAGE PLAN AND PROGRAM

Palmer Airport is 7.5 miles to the southwest. Information concerning these airports is given below:

Airport	Runways No.	Direction	Length (feet)	Hours Attended	Number of Operations/Year
Barker	1	E-W	3,200	None	180
Palmer	1	E-W	2,500	Irregular	*Data Not Available*
	1	SE-NW	1,000		
	1	NE-SW	2,400		

Approximately 30 aircraft are on the field at Palmer Airport, which has inside storage for 22 single engine aircraft. The largest percentage of flying is for pleasure, done on a private basis.

In addition, there is a small private airport, Bent, approximately nine miles southwest of the Somerset site. The length of the longest runway is 2,000 feet.

2.088
Airports in the transmission project area are shown on Figure 1-15. The proposed transmission lines will not interfere with operations at these facilities. The applicant will comply with all Federal Aviation Administration (FAA) regulations.

2.089
Although there is little crop dusting in the vicinity of the Somerset site, there is some aerial application of insecticides and fungicides. In northern Niagara and Orleans Counties, fruit and vegetable fields are dusted, as well as alfalfa fields on many dairy farms. Wheat crops were dusted for army worms in 1976, and there will probably be no need for further dusting for the next 10 years. More spray than dust is used in air service, and there is some activity in all townships where agriculture is intensive. Air service is performed mainly by a private company, Elba Air Dusters, located at the Genesee Airport in Batavia, NY. An estimated three to five planes are used for the western part of New York, including Niagara County. In addition, northern Niagara County is serviced by a crop duster utilizing a single plane that is based at Palmer Airport.

The use of the atmosphere as a dispersion medium for industrial point source discharges is discussed in this chapter in the section entitled "Air Quality."

CULTURAL RESOURCES

2.090
There are two nationally listed, recognized historic places in Lockport, 15 miles south-southwest of the proposed site: the Lowerton Historic District and the Benjamin C. Moore Mill. Furthermore, there are many sites of local significance, such as the lighthouse at Golden Hill State Park, 5.5 miles to the east of the site. The Erie Barge Canal is approximately 10 miles south of the site.

2.091
There are no prehistoric sites recorded by the major literature sources of the area, although a prehistoric site is recorded on Keg Creek, just west of the project area. East of the project area, many arrowheads and stone implements have been found near the mouth of Fish Creek, some dating back several thousand years. No Indian sites, however, were encountered during the onsite inspection, nor are any sites or artifacts known to have been found in the project area.

2.092
There are no sites in the area of the Somerset site that are currently listed in or have been nominated for The National Register of Historic Places, or that are listed in the New York State Facilities Inventory. There are, however, structures of potential cultural interest, as determined from previous research and from field investigations. All houses are shown on the D. G. Beers map of 1875 (Pratt, 1977); consequently, all of these houses are over 100 years old. The following structures are located near or within the project area.

The Huldah Bush House - Huldah Bush was an outstanding figure in Somerset history. The Bush home was a station for harboring runaway slaves in their attempt to escape to Canada by way of the underground railroad. The house is on Lake Road, west of Potter Road, and is presently privately owned. The house is not in the construction area.

The Ezra Mead House - Captain Ezra Mead was an officer in the Civil War. His house is located just southwest of the junction of Potter and Lake Roads. The house is not within the boundaries of the Somerset site.

The Philip Hoag House - The Hoag Homestead is believed to have been built between 1845 and 1850. The house is located on Lake Road, west of Hosmer Road, and is not near the proposed construction area.

The Jeptha Babcock House - The Babcock house was built between 1845 and 1850, and is located on the north side of Lake Road, west of Hosmer Road. The cobblestone house, which is in excellent condition, is privately owned and is one of the most admired landmarks in Somerset. The house is not in the area of the proposed construction.

Early Cabin Sites Along the Lower Lake Road - Several early cabins, built in the early 1800's, stood along Lake Ontario, north of Lower Lake Road. There is presently one building which is still standing. As the proposed project area is more than three-quarters of a mile from the nearest of these structures, they will not be affected by construction activities.

The First Log School House in Somerset - The first schoolhouse, which was built in 1817, was located on Lake Road, near the intersection of Potter Road. The structure was demolished many years ago. The subsurface remains fall within the project area, but are not within the proposed construction zone.

The Archibald McDaniels Grist Mill -Constructed in 1825, this structure was located on Fish Creek where it crosses Lake Road. The mill burned and only subsurface remains are left. It is outside the proposed construction area.

The Poeller House, near the Archibald McDaniels Grist Mill, is located on the north side of Lake Road, east of Hosmer Road. It falls within the project area but is not within the proposed construction zone.

The George Badgley House - The Badgley house has burned to the ground since the preparation of the DEIS, and the remains have been bulldozed by the applicant. Some farm buildings remain, but it is doubtful that they would be of cultural or historical significance.

The Van Wagoner House - The cobblestone house, built in 1848, is located on Hosmer Road, and is now owned by the applicant. A cobblestone tenant house was built sometime after the homestead was constructed, but was razed shortly after 1908. The applicant offered the Van Wagoner house to the Somerset Historical Society, but the idea of moving the building was abandoned due to the prohibitive cost of relocation. Although approximately 46 cobblestone houses are listed as standing in Niagara County as of 1965, interest in the Van Wagoner house is strong. The building is considered of much historic interest both at the local level and as a county historic landmark. It is a handsome, well-preserved building. The house may also meet National Register criteria. The state of preservation, along with the surrounding middens, meet the integrity criterion. The house is

an example of mid-19th century cobblestone construction and is acclaimed by county and local residents. In addition, the building and surrounding middens would probably provide useful information. The onsite inspection of this property revealed several adjoining features, including the foundation of a second building (probably the tenant house) and two refuse deposits. Materials of historic interest were found in both refuse areas, and are listed in the applicant's cultural resources survey report. The house lies within the circle to be encompassed by traffic for the coal handling system.

The Elijah Frost Homestead - At the site where his log cabin stood, Elijah Frost erected a frame house about 1840. The house was located on Lake Road, near Potter Road, and was subsequently purchased by the applicant. The building was badly deteriorated, and, after numerous complaints from residents in the area, was razed by the applicant in 1974. Field investigation of this property revealed the remains of the foundation of a smokehouse behind the house. Other materials were found which indicated the existence of a destroyed barn. Although some useful information might be gathered from a study of the area, the amount would be limited because of past disturbance.

The J. H. Pettit Farm - The Pettit farm consists of a primary house which has been razed, a secondary house which is presently occupied, several outbuildings which have been demolished, a small tenant building which is still standing, and scattered debris. The two farmhouses were built sometime between 1862 and 1875. The principal building, which was close to Lake Road, was purchased by the applicant and later razed. Sometime between 1875 and 1908, three outbuildings were constructed. These buildings were discovered during the field survey. One of these structures consists of an old cobblestone barn foundation, with portions of the wall still standing. Also found were three pillars of kegged cement, an old well with its pump still present, a toppled backhouse, an old galvanized boiler, and some modern trash. A small shake shingled farmhands' building stands nearby, also abandoned. These structures are located at the extreme southwest corner of the construction area. Individual buildings on the Pettit farm, such as the secondary house and the tenant house, may be of historical interest and could conceivably qualify for the National Register.

Of these sites, only the George Badgley House, the Van Wagoner House, and the J. H. Pettit Farm were considered by the State Historic Preservation Office (SHPO) and the National Park Service to be potentially eligible for inclusion in the National Register. In response to this preliminary determination, the District Engineer compiled and submitted required documentation so that a final eligibility determination could be made. On 25 September 1978, this information was

forwarded to the Keeper of the National Register of Historical Places. Findings relative to each of these properties and pertinent correspondence are included in Appendices E and G. For those sites which have been determined eligible, the Corps intends to proceed with the remaining steps of 36 CFR 800 (Advisory Council on Historic Preservation Procedures for the Protection of Historic and Cultural Properties), and to insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met. Corps compliance with appropriate regulations and procedures will insure that proper mitigation measures and/or alternatives are implemented to avoid significant adverse impacts.

2.093
In addition to the cultural material which relates to the sites discussed above, a number of other artifacts were encountered during the survey. These materials relate to modern refuse, thin scatterings of refuse with no concentration, or stray, isolated finds. These areas are considered of low archaeological potential and do not warrant further archaeological investigation.

2.094
The archaeological survey for the Somerset site was conducted during November and December 1976 and January 1977 by Peter P. Pratt, Ph.D., and Marjorie K. Pratt, of Pratt and Pratt Associates, Syracuse, NY. The survey was conducted in accordance with "Procedures for the Protection of Historic and Cultural Properties in New York State." These procedures were adopted in 1975 (revised March 1976) by the New York State Office of Parks and Recreation, the New York State Department of Environmental Conservation, and the U. S. Environmental Protection Agency, Region II. The survey consisted of three parts: (a) a background and literature search to identify known cultural resources; (b) an onsite inspection of the areas of proposed construction; and (c) preparation of a report detailing cultural resources located during the survey, the impact of the proposed construction on such areas, and recommendations concerning such properties.

2.095 The literature and background search was designed to locate any historic or prehistoric site already known in the project area. The literature review also provided a basis from which to predict the probability of finding sites in the area during the onsite inspection. Sources included the National Register of Historic Places, the New York State Facilities Inventory, early county histories, gazetteers, archaeological reports, site files, early maps, and historical society publications. Knowledgeable residents were also interviewed.

2.096
For the purposes of onsite inspection, the proposed construction zones within the Somerset site were divided into a series of transects 100 feet apart. Depending on the boundaries of the site and natural or artificial barriers, transects were located either along a north-south or east-west axis. Transects varied in length depending on their locations with respect to the boundaries of the site.

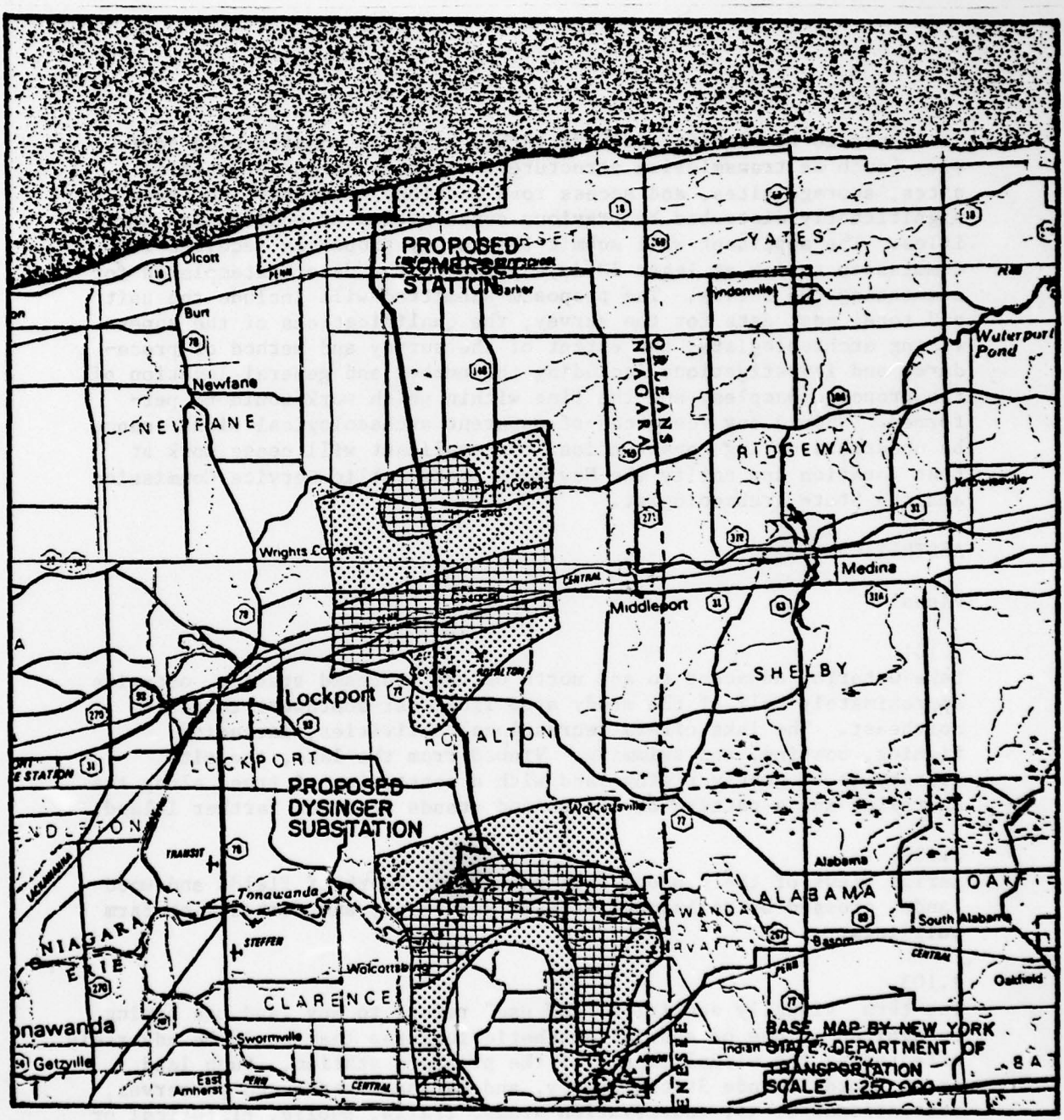
2.097
Because this sampling method is not based on probability sampling, a standard error cannot be calculated. The investigators, however, feel the probability of locating potential cultural resources is high. An examination of archaeological literature indicates that most sites in New York State are at least one-quarter acre in size (approximately 100 feet x 100 feet). By testing at 100-foot intervals, most sites should be encountered. With the addition of the judgmental portion of the sampling design, based in part on the ecological parameters identified during the literature search, the probability of locating cultural resources is further increased.

2.098
Original field notes, maps, and artifacts recovered from the testing are deposited at the State University College, Oswego, NY, and will be available for future study by qualified parties. All cultural materials recovered from the onsite inspection are listed in the cultural resources survey report.

The following historic sites, as listed in the National Register of Historic Places, are located within the transmission line project area and are shown on Figure 1-13. (a) Lockport Industrial District, (b) Lowertown Historic District in Lockport, and (c) Lockport City Hall. The proposed transmission lines will not affect these historic sites, nor any structures of archaeological significance which have been identified.

2.100
Through communications with officials of the New York State Museum and Science Service, it was determined that certain areas of archaeological sensitivity exist within the project area. These areas are indicated on Figure 2.6A.

In accordance with Public Service Commission practice and previous orders in Article VII cases, the applicant will solicit two or more proposals for an archaeological field survey of that portion of the selected route that crosses an area in which archaeologic sites have been recorded or a sensitive area indicated on Figure 2-6A, and that



SOMERSET DYSINGER

345KV TRANSMISSION FACILITIES

NEW YORK STATE ELECTRIC & GAS CORPORATION

ARCHEOLOGIC STUDY

Areas expected to be sensitive.

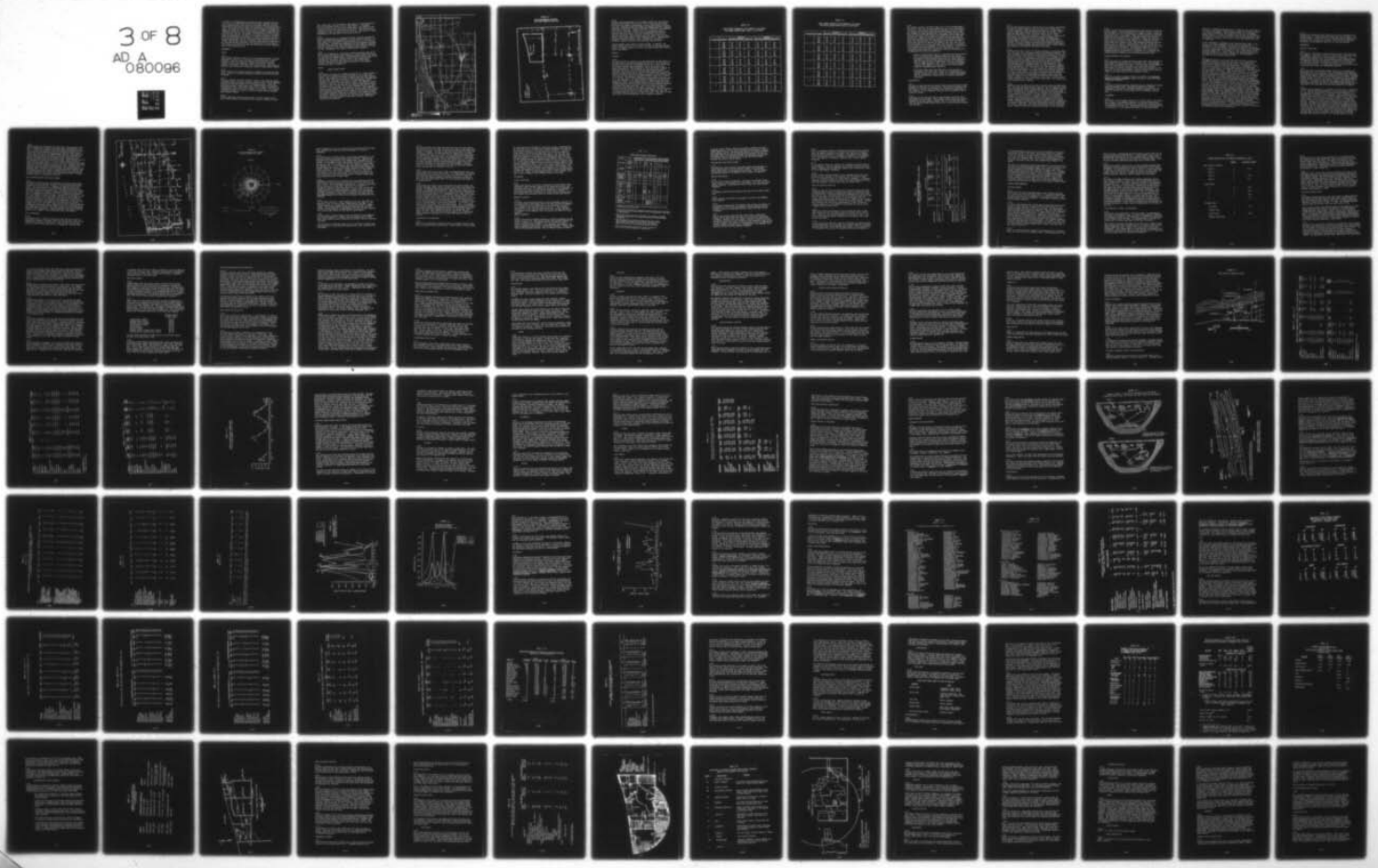
Areas in which archeologic sites have been recorded.

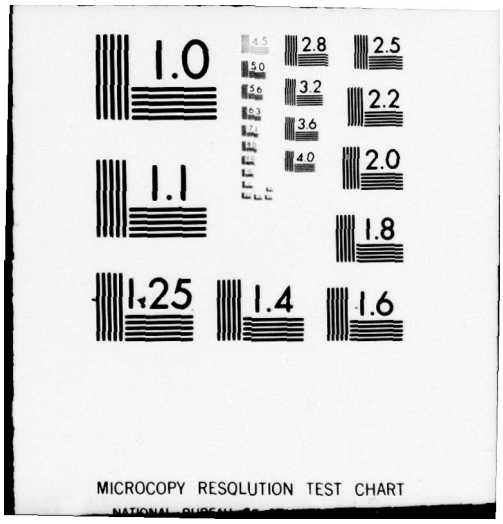
FIGURE 2-6A

AD-A080 096 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 5/5
FINAL ENVIRONMENTAL IMPACT STATEMENT PERMIT APPLICATION BY NEW --ETC(U)
DEC 78 A K MARKS, P G LEUCHNER, R S ROTHMAN

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MICROCOPY RESOLUTION TEST CHART

is likely to be significantly disturbed by major construction activity (such as transmission structure locations, conductor pulling sites, storage sites, and access road loctions) that have not been significantly distrubed by previous construction or cultivation activities. The applicant will submit the survey proposals received for Commission review at least 30 days prior to the date contemplated for commencing the survey. The proposal submitted will include the unit and total cost data for the survey, the qualifications of the supervising archaeologists, the extent of the survey and method of procedures and investigations including the number and general location of the proposed samples, and the time within which work would be performed. Should any resources of apparent archaeological significance be unearthed during construction, the applicant will cease work at that location and notify the New York State Public Service Commission and the State Archaeologist.

AESTHETICS

Visual

2.101
Lake Ontario, adjacent to and north of the proposed station, occupies approximately half of the study area from west-southwest to east-northeast. The lake offers recreational activities, including fishing, boating, and swimming. Viewed from the lake, the site appears to be gently rising land with a scattering of trees along the shoreline and a pattern of fields and stands of trees farther inland.

2.102
Aerial views of the project area show a patchwork of fields and woodlands, crossed by occasional streams and roads, and dotted with farm buildings.

2.103
The term "visually sensitive land use" refers to any land use having recognized unique or special aesthetic features that could be adversely affected by the visual impact of the proposed station. Such land areas would include State, county, and national parks and preserves, recreational areas, conservation areas, trails, public, historical or archaeological sites, and scenic parkways or overlooks. The distance considered extends to a radius of about six miles from the proposed main building complex.

2.104
Visually sensitive land use areas within a six mile radius of the main building complex include Krull Park (County), Golden Hill State

Park, Camp Kenan, and Lake Ontario, described in the Recreation portion of the section on Water Use in this chapter. A potential visually sensitive area is the Erie Barge Canal, used primarily for recreation, located 11 miles south of the site. The Canal could be impacted if a new rail line were built over it. This action is being considered by the applicant in rail route selection.

2.105
Another potential area is a proposed 700-acre wetlands conservation area to be developed approximately five miles south of the site. It will consist of a waterfowl and game preserve as well as controlled hunting lands. Surveying and appraisal have been completed and negotiations by the New York State Department of Environmental Conservation for purchase of the various properties were started in the fall of 1974. Development will begin as funds become available.

2.106
Also to be considered as a potential visually sensitive land use is the proposed Lake Ontario State Parkway, a scenic parkway that would run the width of Niagara County, paralleling Lake Ontario and cutting through the site a short distance south of the station center. Starting and completion dates have not yet been established. Visually sensitive land uses within five miles of the proposed facility are shown in Figure 2-7.

Noise

Ambient Noise Levels

2.107
The Somerset site has a low population density in a rural setting, in which the only industrial activity consists of two storage warehouses. One warehouse is located on Hosmer Road near West Somerset and the other about one mile west of the intersection of Hosmer Road and Route 18. Therefore, the number of sound sampling points required to describe this area was not large. The dominant sources of noise at this site are wave action along the Lake Ontario shore, vehicular traffic on Route 18, the noise associated with the operation of the two warehouses, and sounds of nature. Noise sampling locations were selected to describe areas with dominant noise sources and to determine the ambient noise levels at the quietest locations. In addition, sampling locations at potential noise sensitive areas were used. Figure 2-8 indicates the location of the sampling points and denotes the noise sensitive land uses, including residences, churches, and cemeteries.

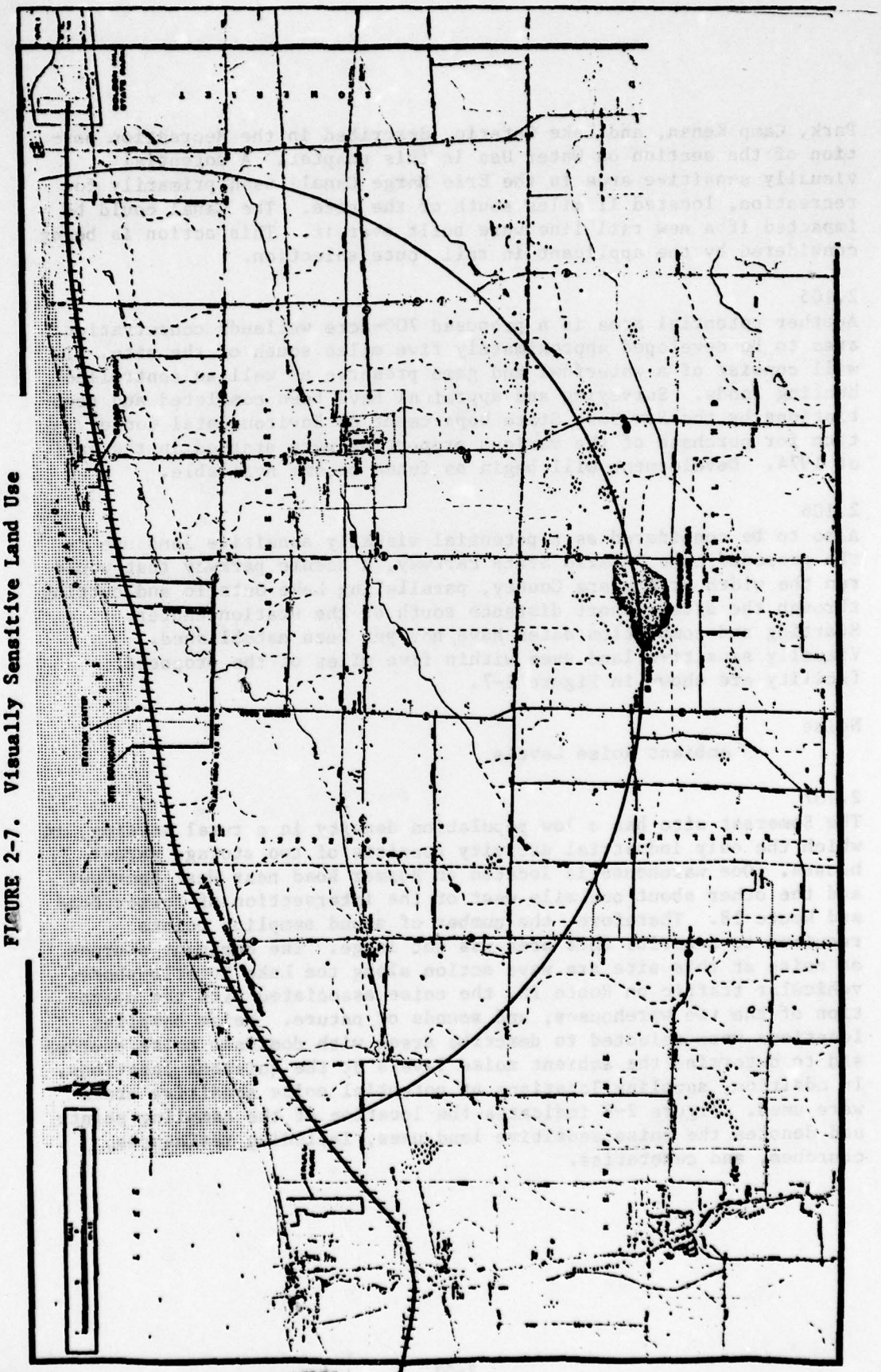
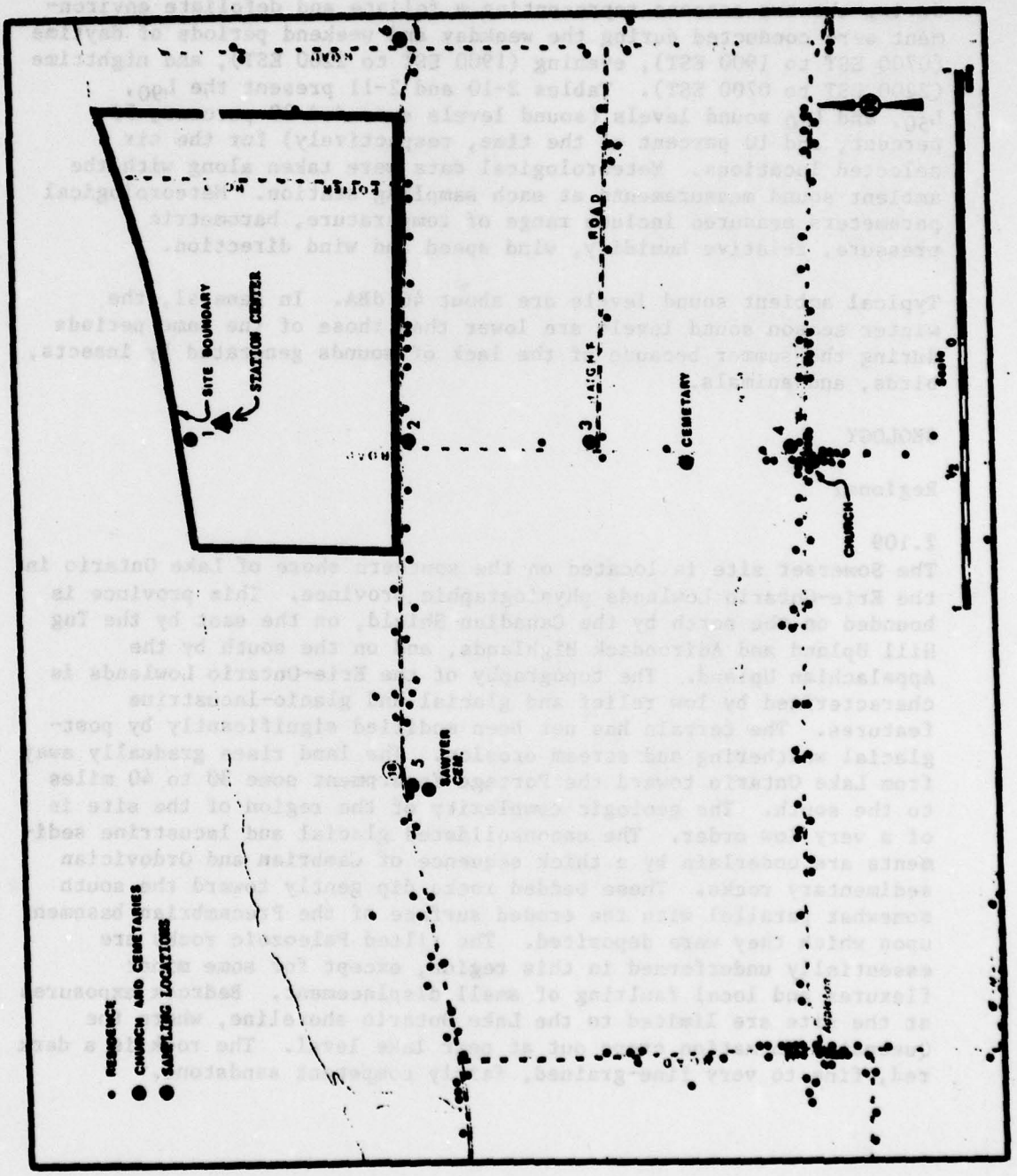


FIGURE 2-7. Visually Sensitive Land Use

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FIGURE 2-8

NOISE MEASUREMENT LOCATIONS AND NOISE SENSITIVE LAND USE



2.108
Ambient sound measurements at each sampling point were made during September and November 1973 and June 1974. Ambient noise surveys during the two seasons representing a foliate and defoliate environment were conducted during the weekday and weekend periods of daytime (0700 EST to 1900 EST), evening (1900 EST to 2200 EST), and nighttime (2200 EST to 0700 EST). Tables 2-10 and 2-11 present the L_{90}, L_{50}, and L_{10} sound levels (sound levels exceeded 90 percent, 50 percent, and 10 percent of the time, respectively) for the six selected locations. Meteorological data were taken along with the ambient sound measurements at each sampling station. Meteorological parameters measured include range of temperature, barometric pressure, relative humidity, wind speed and wind direction.

Typical ambient sound levels are about 40 dBA. In general, the winter season sound levels are lower than those of the same periods during the summer because of the lack of sounds generated by insects, birds, and animals.

GEOLOGY

Regional

2.109
The Somerset site is located on the southern shore of Lake Ontario in the Erie-Ontario Lowlands physiographic province. This province is bounded on the north by the Canadian Shield, on the east by the Tug Hill Upland and Adirondack Highlands, and on the south by the Appalachian Upland. The topography of the Erie-Ontario Lowlands is characterized by low relief and glacial and glacio-lacustrine features. The terrain has not been modified significantly by post-glacial weathering and stream erosion. The land rises gradually away from Lake Ontario toward the Portage Escarpment some 30 to 40 miles to the south. The geologic complexity of the region of the site is of a very low order. The unconsolidated glacial and lacustrine sediments are underlain by a thick sequence of Cambrian and Ordovician sedimentary rocks. These bedded rocks dip gently toward the south somewhat parallel with the eroded surface of the Precambrian basement upon which they were deposited. The tilted Paleozoic rocks are essentially underformed in this region, except for some minor flexures and local faulting of small displacement. Bedrock exposures at the site are limited to the Lake Ontario shoreline, where the Queenston Formation crops out at near lake level. The rock is a dark red, fine to very fine-grained, fairly competent sandstone.

TABLE 2-10

NOISE LEVELS OBTAINED AT THE SOMERSET SITE DURING THE SUMMER SEASON SURVEY (dBA) re $2 \times 10^{-5} N/m^2$

Location	Parameter	Weekday			Weekend		
		Daytime	Evening	Nighttime	Daytime	Evening	Nighttime
1	L90	52	40	40	42	38	28
	L50	54	42	42	42	38	28
	L10	56	44	42	44	40	28
	LEQ	54	42	42	43	39	28
2	L90	38	32	32	42	32	34
	L50	44	32	32	46	40	44
	L10	64	50	32	60	56	58
	LEQ	61	50	32	56	54	58
3	L90	34	32	32	38	32	24
	L50	36	34	34	40	34	24
	L10	38	46	40	54	48	26
	LEQ	36	56	59	66	60	25
4	L90	38	40	40	40	42	24
	L50	40	42	40	40	42	24
	L10	56	46	40	40	42	24
	LEQ	55	53	40	40	42	24
5	L90	46	34	36	40	34	54
	L50	50	36	38	44	36	54
	L10	68	46	44	64	46	54
	LEQ	74	57	56	70	57	54
6	L90	34	32	32	42	34	30
	L50	38	38	34	48	36	48
	L10	52	52	34	60	56	62
	LEQ	52	54	34	55	52	61

TABLE 2-11

NOISE LEVELS OBTAINED AT THE SOMERSET SITE DURING THE WINTER SEASON SURVEY (dBA) re $2x10^{-5}N/m^2$

Location	Parameter	Weekday			Weekend		
		Daytime	Evening	Nighttime	Daytime	Evening	Nighttime
1	L90	38	38	40	52	46	40
	L50	40	40	42	54	48	42
	L10	48	42	44	56	50	44
	LEQ	44	40	42	54	48	42
2	L90	42	30	30	40	30	30
	L50	46	34	34	42	32	32
	L10	58	52	42	48	36	36
	LEQ	56	56	38	57	33	37
3	L90	30	28	28	36	30	28
	L50	30	28	28	40	30	30
	L10	36	30	30	50	34	32
	LEQ	36	29	29	58	32	30
4	L90	40	40	40	44	42	42
	L50	44	42	42	46	42	42
	L10	60	42	42	48	44	44
	LEQ	61	41	43	57	43	43
5	L90	32	26	28	40	30	26
	L50	38	28	30	44	30	28
	L10	58	52	42	56	42	30
	LEQ	57	57	51	69	52	29
6	L90	30	24	24	40	30	26
	L50	34	26	26	42	30	28
	L10	40	32	30	44	34	30
	LEQ	55	32	27	42	33	30

2.110
The closest relevant structure to the site is the Clarendon-Linden fault/fold. The fault has been mapped from the town of Troutburg on the shore of Lake Ontario south for approximately 70 miles through the villages of Clarendon and Linden to the Allegheny County Line. This feature has been described as a high-angle, reverse fault downthrown on the west, which passed into a monocline in the beds near the surface. Seismic work south of Batavia has substantiated the fault and confirmed well data and structural contour map interpretations that the main fault is a high-angle reverse fault at depth. Within the upper 400 to 800 feet of surface, the fault dies out and the near-surface rock column is folded, with some small, en-echelon faults common along the alignment of the main flexure. An evaluation of available data correlated with project observations on the Clarendon-Linden faults/fold indicate the following limitations and circumstances that must be considered:

- Dating of the movement along the faults/fold has been relative only, as inferred from subsurface maps and other sources. No surface dislocations associated with the faults have been identified in the overlying Pleistocene and recent deposits, that are unequivocally postglacial in origin (R. Fakunding, 1974-75; Dames and Moore, 1974, 1975). No tectonic evidence is known that suggests a young date for the fault movement along the Clarendon-Linden structure.

- Earthquake events have been monitored in the vicinity of Attica-Dale, NY, since 1971. There is no demonstrated site-specific connection to date between the scattered earthquakes and the site-specific faults except in a general geographic occurrence.

Site-Specific

2.111
The site is characterized by a gently undulating surface which slopes gradually to the shore of Lake Ontario. This surface represents the old bottom of glacial Lake Iroquois, the Pleistocene predecessor of Lake Ontario. It has undergone relatively minor postglacial modification by streams.

2.112
Elevations of the shoreline bluffs range between 270 and 310 feet above Mean Sea Level (MSL). The erosional cliffs along the northern boundary of the site range in height from 15 to 30 feet above the level of the lake except where they are cut by small gullies draining into the lake.

2.113
The old lake bottom surface on which the site is located rises gently southward at approximately 10 feet per mile to the ancient Lake Iroquois shoreline. This shoreline is marked by a slightly sinuous, gravelly ridge approximately eight miles south of the site. The ridge averages about 25 feet of relief locally and is roughly parallel to the present day shoreline of Lake Ontario. North of the beach ridge, the topography reflects Lacustrine sediments and reworked ground moraine. South of the ridge, the topography is attributable to the effects of Lake Wisconsin glaciation (last ice sheets). This area (between the ridge and the Niagara Escarpment to the south) contains numerous glacial features such as eskers, kames, kame terraces, end moraines, and drumlinlike forms.

2.114
Surficial materials at the site consist primarily of lacustrine sand, silt, and clay, with some minor fluvial and wind-blown sediment. The total thickness of the Pleistocene and Holocene deposits at the site, as occurs in the cliffs and as is represented in the borings, ranges from 13 to 30 feet. Thicknesses of the units are variable, due to a number of causes including local variations in bedrock elevations, differential erosion between periods of deposition of successive straitigraphic units, postglacial erosion, and deposition. The sequence consists, in ascending order, of older lacustrine deposits (overlying bedrock), red till, purple till, Lake Iroquois deposits, and postglacial deposits. The till deposits are generally composed of fine to coarse gravels in a matrix of silty or clayey sands and are dense to very dense. The older outwash deposits are composed of silty fine sand with varying amounts of gravel. These soils are generally dense but are intermixed with discontinuous lacustrine deposits composed of soft to medium silt and clay. The more recent outwash deposits are composed of silts, silty sands, and clayey silts with varying amounts of gravel.

2.115
Because of the low relief of the site, fluvial erosion has been minimal. The short gullies which have been cut into the shoreline cliffs along the lake are slowly eroding headward. This is evident from the lack of vegetation at the heads of the gullies and along the gully walls. No significant accumulations of sediment were noted within or at the mouths of the gullies. The main reason for the youthful appearance of the gullies is the rapid retreat of the shoreline bluffs. Shoreline erosion is primarily the result of wave action during storms and mass wasting of the over-steepened and undercut cliffs. Erosion is taking place rapidly enough so that no vegetation can become established - even when slumping has produced relatively low slopes. Many large trees have been undercut and lie across the beach. Several others are clinging precariously at the cliff edge.

2.116
Locally, glacial and alluvial deposits have been used as a source of sand and gravel. These deposits are of a spotty occurrence, and contain too much silt to be of significant commercial value. Quarrying operations exist in the region. There are no quarries near the site. Construction and operation of the proposed facility will neither affect nor be affected by these operations. Commercial quantities of natural gas are produced in the general area, primarily from the Lower Ordovician (Trenton) rocks. The producing formations are estimated to lie at a depth of approximately 1,100 feet at the site. Construction and operation of the proposed facility should not affect gas production in the region. The Queenston Formation is not a potential source of oil or gas for commercial use. There are no underground mining operations in the vicinity of the Somerset Site. Surface mining is limited to the aforementioned gravel pits.

Geological/Events and Anomalies

2.117
There have been no recorded geological events which have resulted in major damage within 25 miles of the Somerset Site. Slight damage resulted in the immediate vicinity of Attica during the earthquake of 1929. The epicenter of this event is 35 miles from the site. Furthermore, no relevant geologic events have been reported in the area, nor are there any man-made or natural features which result in damage at the site during a future geological event.

2.118
There are no unique or natural features as listed in the National Registry of Natural Landmarks, updated through 10 June 1976, found in the site vicinity.

2.119
No unique or unusual geologic formations will be affected by the proposed transmission lines. The National Register of Natural Landmarks, as updated in the Federal Register through 8 June 1976, does not indicate any such resources in the transmission project area.

Groundwater

2.120
Groundwater at the Somerset site occurs in three zones: the overburden, a zone in the uppermost bedrock, and the main bedrock mass. The overbuden consists of glacial till overlain by laminated layers of Lacustrine silt and clay. Immediately underlying the glacial till is the bedrock, of the Queenston formation, a fine agrillaceous

sandstone. Underlying the Queenston at a depth of 150 to 200 feet at the site is the Oswego formation which consists of calcareous shale or calcareous sandstone. The thickness of the total overburden ranges from 13 to 33 feet and averages about 20 feet as indicated by borings drilled in the site vicinity. The Lacusrine deposits at the site range in thickness from a few to 15 feet and average about six to eight feet.

In the overburden, groundwater occurs below the water table in the pores of the slowly permeable till and Lucustrine deposits. Groundwater in the overburden is generally in hydraulic continuity with that in the upper bedrock, and the water table in the overburden is usually higher than the piezometric level of groundwater in the uppermost bedrock zone. This indicates that downward movement into the upper bedrock is occurring. Recharge to the overburden is generally by infiltrating precipitation.

2.121
The uppermost bedrock is the most important zone when considering groundwaer resources, because in most cases it has higher permeability and specific yield characteristics than the other two zones, and it contains relatively fresh water. Groundwater in this zone occurs primarily in the open bedding joints and high-angel joints. In this report, the uppermost bedrock zone is referred to as the "groundwater reservoir." This zone consists of: (1) an upper weathered unit, two to three inches thick, in which the rock has undergone extensive weathering and alterations; (2) the underlying highly fractured and slightly weathered rock, perhaps one to three feet thick; and (3) the water-filled bedding joints, at greater depths, that are connected to the uppermost zone by open high-angle joints. The thickness of this third unit is uncertain, but may range up to 100 feet depending on the vertical extent of the interconnected fractures at any given location. The lower main bedrock contains several isolated joint systems, each one of which is, in most cases, effectively isolated from the overlying groundwater reservoir. These joint systems consist of isolated bedding joints or a group of closely spaced bedding joints that commonly contain highly saline water and combustible gas under confined pressure. Gas drive and the confined pressure of the water sometimes cause the flow of this water and gas mixture up to the ground surface in wells and borings tapping the lower main bedrock zone. This type of flow is generally short-lived. Groundwater occurring in the groundwater reservoir (uppermost bedrock) and the overburden is actively taking part in the hydrologic cycle to a significant extent. A schematic presentation of the hydrogeologic zones found at the site is given in Figure 80.2-21-S of the applicants Article VIII application.

2.122
As mentioned previously, well yields in the area are generally low, ranging from 1 to 20 gpm with the average less than five gpm. It is doubtful whether a yield of as much as 20 gpm could be obtained continuously from a single well in any of the three water zones (the overburden, the groundwater reservoir, or the lower bedrock).

METEOROLOGY

Regional Climatology

2.123
The regional climatology is characterized by long, cold winters and cool summers. Lake Ontario and, to a lesser extent, Lake Erie exert considerable influence on the meteorology of this region. In general, lake effects (e.g., lake breezes) are most pronounced near the immediate shoreline and decrease in magnitude as distance from the shoreline increases, although the reverse is true for lake-related precipitation. Air masses which pass over Lake Ontario prior to entering this region are considerably modified.

2.124
Data collected by the National Weather Service at the Buffalo (40 kilometers south of the Somerset site) and Rochester (60 kilometers ESE) Airports provide long-term records which characterize the climatology of the region in which the Somerset Site is located. Although Buffalo Airport is closer to the site than Rochester, the Rochester Airport is much closer to Lake Ontario, being 10 kilometers from the shoreline. It should be noted that the Somerset Site borders the Lake Ontario shoreline and certain lake-induced phenomena may not be reflected in the long-term data from either Rochester or Buffalo.

2.125
The mean annual temperature at Rochester is 48°F, while at Buffalo it is 47°. The January mean temperature at both locations is 24°F and the July mean is around 70°F. The average relative humidity is approximately 70 percent at both airports. Both locations receive slightly more than 50 percent of possible sunshine with a mean cloud cover of about 70 percent from sunrise to sunset. Average annual precipitation is 31.33 inches for Rochester and 36.11 inches for Buffalo. Snowfall for both airports averages just under 90 inches per year, although both snowfall and precipitation amounts vary considerably over the region because of lakes and topographical effects. During the winter of 1976-1977 the Buffalo area recorded nearly 200 inches of snow, and both Buffalo and Rochester are well above the 90 inch average for 1977-1978. Heavy fog is observed on an average of thirteen days per year at Rochester and twenty days at Buffalo. Rochester has a mean wind speed of 9.7 mph and Buffalo 12.3 mph.

2.126
Severe weather in northwestern New York State occurs mostly in the form of snowstorms, freezing rain, high winds, thunderstorms, and hail. As much as 30 inches of snowfall have been recorded in a 24-hour period in the Rochester area, but snowfall amounts can vary widely over the area due to physiographic effects. High winds can occur during any month, although the peak for both Rochester and Buffalo was associated with an intense January 1950 storm when Buffalo recorded 91 mph and Rochester 73 mph. Thunderstorms occur on the average of 30 days per year in northwestern New York State, mostly during summer months. A few of these thunderstorms are accompanied by very high surface wind gusts and hail. Tornadoes have been observed on rare occasions in this region. Nine tornadoes have occurred during the period 1950-1975 within 50 nautical miles of the Somerset Site. Of these nine, the maximum width was 1,800 feet and the maximum length was 12 miles. Fringe effects of hurricanes and tropical storms, in the form of heavy rains and moderate to strong surface winds, are infrequently observed.

Onsite Meteorological Monitoring Program

2.127
Wind speed, wind direction, and temperature data were continuously collected at the 10 and 60 m levels of a 60 m meteorological tower located on the Somerset Site. Dewpoint was measured at the 10 m level. The tower is about 1.25 kilometers from the Lake Ontario shoreline, as is shown in Figure 2-9. Wind speed and wind direction data were reduced to 15-minute averages, centered on the hour, while the 10 m temperature, dewpoint, and 10-60 m temperature difference (ΔT) were reduced to hourly averages, centered on the half-hour. The 60 m wind direction trace was used to calculate a value of σ, the standard deviation of the horizontal wind direction fluctuations. The wind, temperature, and dewpoint data summarized in the following subsection on local meteorology were collected over the period 1 August 1974 to 31 July 1975. Upper air data were collected during a balloonsonde measurement program conducted for two 30-day periods in the summer and fall of 1974. The data collected by the balloonsonde system included temperature, relative humidity, wind speed, and wind direction to a height of three kilometers above the surface.

Local Meteorology

2.128
The Somerset Site is located on basically flat lake plain with few topographic features. The annual wind rose for the 60 m level of the onsite tower is shown in Figure 2-10. The 10 m wind rose is very similar to the 60 m wind rose and is not presented. The mean wind

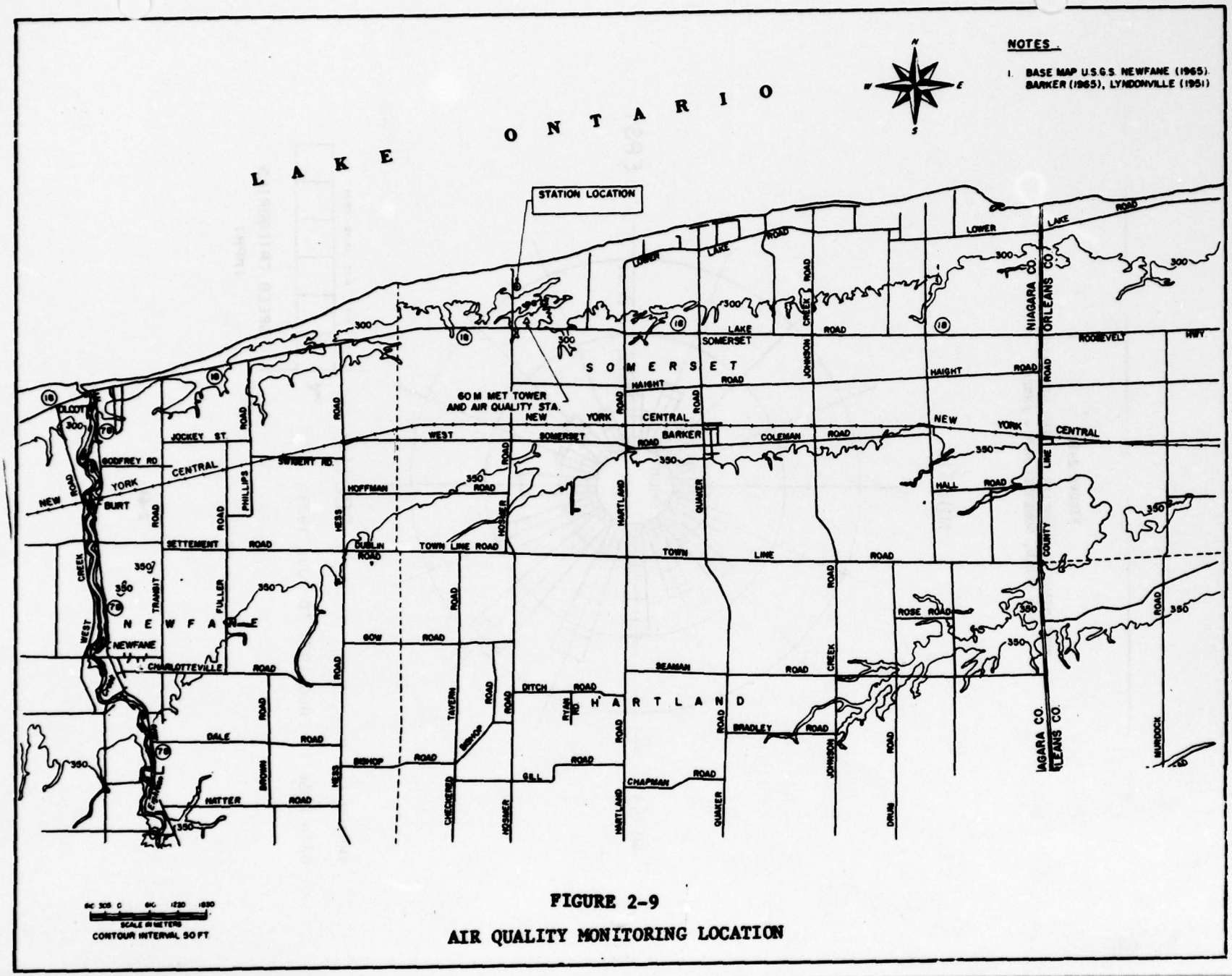
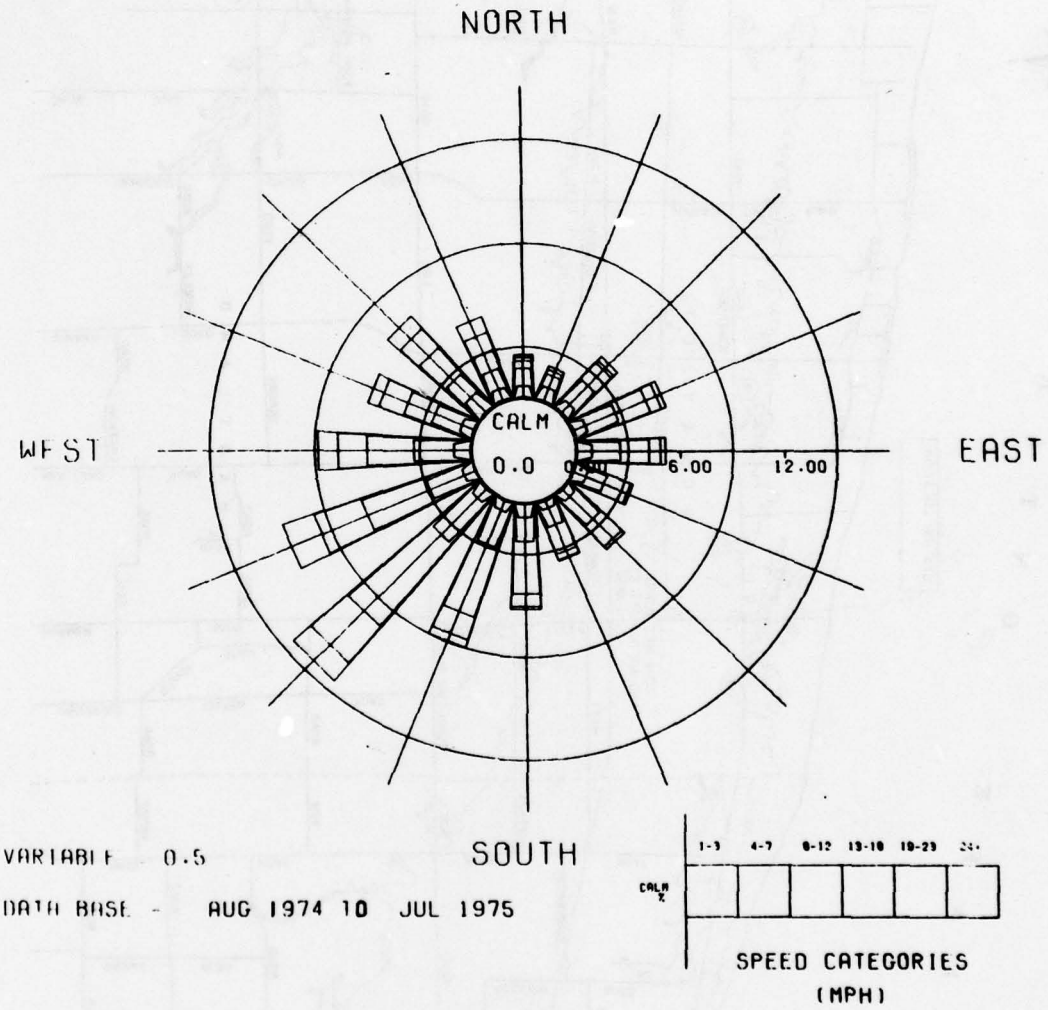


FIGURE 2-9

AIR QUALITY MONITORING LOCATION

FIGURE 2-10

PERCENTAGE FREQUENCIES OF WIND DIRECTION AND SPEED, SOMERSET 60M - ANNUAL



speed at Somerset for the 10 m level was 9.4 mph during the data base year, slightly less than the long term average of 9.7 mph at Rochester.

2.129
Lake breezes are a critical factor in lake breeze fumigation, an air pollution condition associated with stack emissions. Although not prevalent on an annual basis, lake breezes occur frequently in the spring. At the Somerset Site, lake breezes occurred on 33 percent of the days in June and 21 percent of the days during the period from May through July. If the Somerset data were based on shoreline lake breezes rather than those 1.2 km inland, slightly higher frequencies would be expected. The monthly average duration of a lake breeze varied from five to nine hours. Gradient wind events, similar to lake breezes, occurred on 58 percent of the days in May and 34 percent of the days in the entire study period. Monthly average durations lasted from five to eight hours.

2.130
Atmospheric stability for the Somerset Site was determined from the wind direction trace fluctuations observed at the 60 m level of the onsite tower. The fluctuations observed over a 15-minute period were used to calculate a value of σ_θ, which was then related to atmospheric stability class (A,B,C,D,E,F, or G). Most of the time, slightly stable (E) conditions prevail, largely due to the smooth topography in the area that minimizes horizontal wind fluctuations. The large percentage of winds with a projectory over water and the measurement height of 60 m also tend to minimize recorded wind fluctuations.

2.131
Over the data base year, a mean temperature of just under 48°F was measured at the 10 m tower level, which compares favorably to the long-term means of 47°F and 48°F at Buffalo and Rochester, respectively. The average dewpoint during the data base year was 39°F. Average relative humidity is approximately the same as that observed over a much longer period at both Buffalo and Rochester.

2.132
A meteorological condition that occurs occasionally at the Somerset Site is the presence of a Thermal Internal Boundary Layer (TIBL) which slopes upward from the shoreline as distance from the shoreline increases.

This situation is sometimes conducive to an increase in ground level concentrations of stack effluents emitted from a tall stack near the lake shore.

2.133
As onshore breezes are heated when they pass over the land surface, the character of the air near the ground is quickly transformed from stable to unstable. The TIBL is the interface between the stable and unstable air masses. The more rapidly the onshore flow is heated, the steeper the slope of the TIBL. With a sufficiently steep slope, the TIBL will be above the top of the proposed stack and emissions will be fumigated to ground level in the unstable air. If the slope of the TIBL is more gradual, so that the top of the stack is above the TIBL, emissions will be carried downwind as normal until they encounter the TIBL, at which point they will fumigate to ground level. If the TIBL is sufficiently low and its slope very gradual, stack emissions may not encounter it at all.

2.134
Since onshore flow occurs with a TIBL, the maximum ground level concentrations occur several miles inland. An investigation of relevant meteorological data for April, May, June, and July 1974 indicated that this lake breeze fumigation condition would have occurred on about six days during these months for the proposed stack height at the Somerset Site.

2.135
Those months were chosen on the expectation that more frequent and possibly stronger onshore flows of stable air would occur during that period. The maximum fumigation affect requires clear skies and a maximum of incoming solar radiation. Clear skies and a light onshore breeze around solar noon in late June maximize the TIBL influence on the surface concentrations of a contaminant from a power plant stack. Further discussions and case studies of lake breezes, TIBL's, and onshore gradient flow conditions can be found in Appendices 73.4-3-S, 73.4-4-S, and 73.4-5-S of the applicant's Article VIII application. A more detailed summary of the local meteorology is available in Part 73.2-S. The applicant's Article VIII application is on file at the Buffalo District office, U.S. Army Corps of Engineers. In response to an agency comment regarding the meteorological assumptions implied from these lake breeze fumigation studies, two additional months of onsite date have been examined during the late spring and early summer of 1976. These additional studies support the original lake breeze fumigation assumptions of the applicant based on the 1974 studies.

Lake Ontario Ice Conditions

2.136
Shore ice is occasionally observed along the southern shores of Lake Ontario between Buffalo and Rochester. Yearly reports on Great Lakes

ice cover have been published for each winter season, beginning with the 1962-1963 season, although only limited information was obtained for Lake Ontario prior to the winter season 1971-1972. A review of these reports indicates that some shore ice is observed along the southern shoreline of Lake Ontario each winter. For the most part, shore ice occurs near the mouth of the Niagara River and also from Rochester eastward. In the vicinity of the Somerset Site, no shore ice was observed during the winter seasons 1972-73, 1973-74, or 1974-75. In the winter season of 1971-72, shore ice with 40 percent to 60 percent coverage was observed along the entire southern shore of Lake Ontario during early March. Prior to the winter season 1971-72, only very limited data were available on Lake Ontario ice coverage. The 1962-63 season, when Lake Ontario was estimated to be 51 percent ice-covered, was apparently the most severe winter season between 1962-63 and 1974-75. Normal coverage ranges between 10 and 20 percent, with most of the ice being in the northeast section of the lake.

AIR QUALITY

Present Conditions

2.137
Present area sources of airborne contaminants include fugitive dust, residential space heating, commercial and industrial boilers, and automotive emissions. The dispersive properties of the atmosphere in this region are generally good and no violations of ambient air quality standards were recorded by the onsite sulfur dioxide, nitrogen dioxide, and particulate monitors during the data base period.

Emission Inventory

2.138
The highly industrialized portions of Erie and Niagara Counties, in and around Buffalo and Niagara Falls, NY, which contain the majority of the emission sources represented in the inventory, are well to the southwest of the Somerset Site (50-60 km). A 1970 emission inventory by source type and pollutant for the counties including and adjacent to the Sommerset Site is presented in Table B-5 of the appendix.

Ambient Standards

2.139
The New York State and Federal Ambient Air Quality Standards are presented in Table 2-12. The Federal primary and secondary ambient air quality standards were promulgated for six pollutants (sulfur dioxide, suspended particulates, carbon monoxide, photochemical oxidants, nonmethane hydrocarbons, and nitrogen dioxide). Primary standards are those judged necessary, with an adequate margin of safety,

TABLE 2-12

SUMMARY OF AMBIENT AIR STANDARDS - FEDERAL AND STATE

Contaminant	Interval	Federal Std (Primary)		New York State Standards			Federal Std (Secondary)	
		PPM	$\mu g/m^3$ (25°C)	PPM	$\mu g/m^3$ (25°C)	Level(s)	PPM	$\mu g/m^3$ (25°C)
SULFUR DIOXIDE	(Annual) Arithmetic Mean	0.03	80	0.03	80	All		
	24-Hr Conc	0.14	365	0.14	365	All		
	3-Hr Conc			0.50	1300	All	0.50	1300
PARTICULATE (Suspended)	(Annual) Geometric Mean		75		75	IV		
					65	III		60
					55	II		
					45	I		
	24-Hr Conc		260		250	All		150
CARBON MONOXIDE	8-Hr Conc	9	10 mg/m³	9	10 mg/m³	All	9	10 mg/m³
	1-Hr Conc	35	40 mg/m³	35	40 mg/m³	All	35	40 mg/m³
PHOTOCHEMICAL OXIDANTS	1-Hr Conc	0.08	160	0.08	160	All	0.08	160
HYDROCARBONS (Non-Methane)	3-Hr Conc (6-9 a.m.)	0.24	160	0.24	160	All	0.24	160
NITROGEN DIOXIDE	(Annual) Arithmetic Mean	0.05	100	0.05	100	All	0.05	100
FLUORIDES a) Total Fluorides as F (Dry Weight Basis)	(6 months) Growing Season			40		All		
	Any 60-Days			60		All		
	Any 30-Days			80		All		
b) Gaseous Fluorides as F (Volume Basis) parts per billion	12-Hr Conc			4.5 ppb	3.7	All		
	24-Hr Conc			3.5 ppb	2.85	All		
	1-Wk Conc			2.0 ppb	1.65	All		
	1-Mo Conc			1.0 ppb	0.8	All		
BERYLLIUM	1-Mo Conc				0.01	All		
HYDROGEN SULFIDE	1-Hr Conc			0.01	14	All		
SETTLEABLE PARTICULATES (Dust Fall-State Standards Only)	(Annual) Geometric Mean				.60 mg/cm²/mo	IV		
					.40 mg/cm²/mo	III		
					.30 mg/cm²/mo	II		
					.30 mg/cm²/mo	I		

1. Both New York and Federal standards, except for annual values, are not to be exceeded more than once per year.

2. New York State is divided by air quality priorities into four levels: from Level I, denoting the areas of least pollution to Level IV being generally urban areas of heavy pollution.

3. New York also has 3-hr and 24-hr 99-percentile SO_2 standards (for ambient enforcement purposes only) of 0.25 ppm (650 ug/m3) and 0.10 ppm (260 ug/m^3) respectively.

4. New York also has 30, 60, and 90 day arithmetic mean TSP standards (also for ambient enforcement purposes only) of 80, 100, 115, 135 ug/m^3 (30-day, Level I-IV), 70, 85, 95, and 115 ug/m^3 (60-day, Level I-IV), and 65, 80, 90, and 105 ug/m^3 (90-day, Level I-IV).

5. New York also has monthly 84-percentile dustfall standards of 0.45, 0.45, 0.60, and 0.90 mg/cm^2/ mo (Levels I-IV)

to protect public health, while the secondary standards are those judged necessary to protect public welfare from any known or anticipated adverse effects. New York State ambient air quality standards were developed for the six aforementioned pollutants, and also for fluorides, beryllium, hydrogen sulfide, and settleable particulates. The Somerset Site is located within the New York State Niagara Frontier Air Quality Control Region.

Site-Specific Monitoring Program

2.140
The applicant's site-specific monitoring program included data on sulfur dioxide (SO_2), nitrogen dioxide, (NO_2), total suspended particulates (TSP), and settleable particulates. The air quality monitoring location at the Somerset Site is shown in Figure 2-9.

Ambient Air Quality

2.141
SO_2 data from Lockport, Middleport, and Akron, the regional urban areas closest to the Somerset site (see Figure 1-12), are well below ambient standards. Site-specific data are also well below ambient standards.

2.142
All regional urban and site-specific NO_2 data are well below standards.

2.143
Carbon monoxide (CO) levels are assumed to be low in the Somerset Site vicinity.

2.144
The applicant assumes that the Somerset Site vicinity is subject to violations of the one-hour photochemical oxident (measured as O_3) standard, since all continuous monitors in New York State record violations.

2.145
Most of the regional urban TSP data from Lockport, Middleport, Albion, Akron, and Medina (see Figure 1-12) are below the ambient standards. However, there are several locations in Lockport where the Federal Secondary 24-hour standard or State geometric mean standard are violated. The impact of the proposed facility on ambient TSP levels at these locations will be insignificant. The Somerset site-specific TSP data is below ambient standards.

2.146
Most of the regional dustfall (settleable particulate) data are also below the ambient standards, but there is one location in Lockport where the State standards are violated. The impact of the proposal facility on dustfall levels in Lockport is expected to be insignificant. The Somerset site-specific dustfall data is below ambient standards.

2.147
No site-specific data are available for atmospheric radioactivity or trace elements. State and regional data indicate these to be below ambient standards and the applicant assumes that site-specific levels are also below ambient standards.

2.148
Sulfur dioxide, nitrogen dioxide, total suspended particulate, and dustfall levels measured at the Somerset Site are given in Table 2-13. All reported values are within ambient standards. In general, measured air quality levels are typical of a rural agricultural area, with some regional influence noted from the Buffalo area.

High Air Pollution Potential

2.149
Periods of high air pollution potential are usually associated with stagnating anticyclones, an average wind speed of four m/sec or less, no precipitation, a shallow mixing depth (morning mixing layer less than 500 m), and a forecasted afternoon ventilation of less than 6,000 m^2/sec (ventilation is the product of the mixing depth and the average wind speed through the mixing layer). These are the criteria established in the National Air Pollution Potential Program. Studies have indicated that there were approximately 12 days of high air pollution potential in the Somerset area during the 10-year period 1 August 1960 to 3 April 1970.

2.150
Twenty-two anticyclone stagnation cases lasting four days or more were reported in the site region during the 30-year period 1936 to 1965. There were two extreme episodes of seven days or more. The fall months have the highest frequencies of occurrence; the winter months, the lowest.

2.151
In the period since mid-1974, when the continuous air quality station became operational, there have been two potential high air pollution episodes identified in the Somerset Site region. The first was from 9-11 November 1974, when an air stagnation advisory was issued by

TABLE 2-13

SOMERSET SITE MONITORING PROGRAM
COMPARISON OF SO_2, NO_2, TSP, AND DUSTFALL WITH AMBIENT AIR QUALITY STANDARDS
DATA BASE 8/1/74 - 7/31/75

SO_2 and NO_2 (ppm)

	3 hr Max (SO_2)	24 hr Max (SO_2)	Arithmetic Mean (SO_2)	Arithmetic Mean (NO_2)
Ambient standard	0.50	0.14	0.030	0.050
Somerset value	0.07	0.04	0.011	0.011

	30-day Dustfall[a] mg/cm^2/mo		24-hr Total Suspended Particulates[b]		
	Median	84-percentile	Geometric Mean	Maximum	Second Max
Ambient standard	0.30	0.45	45	250	150
Somerset value	0.14	0.28	32	141	109

a. Data Base 2/76 - 1/77.

b. Samples taken every third day

the National Weather Service for the area from Buffalo to Syracuse. Air quality levels at the onsite continuous station did increase during this period, with hourly sulfur dioxide levels peaking at 0.035 ppm, and hourly nitrogen dioxide levels peaking at 0.040 ppm, both late on 11 November 1974. The 24-hour total suspended particulates recorded on this date were somewhat above normal, at 50 ug/m^3.

The second air stagnation episode identified was a five-day period at the end of July and beginning of August 1975. Sulfur dioxide at the continuous monitor was somewhat higher than normal, with hourly values ranging from 0.015-0.025 ppm from 1-3 August 1975. Nitrogen dioxide was intermittently above normal, with hourly values peaking at 0.0200.033 ppm from 1-4 August. Total suspended particulates, however, showed the greatest increase above normal, with 24-hour values ranging from 114-141 ug/m^3 from 31 July to 2 August 1975. In general, higher levels of SO_2, NO_2, and TSP were observed with winds from the direction of Niagara Falls and Buffalo (SW-SSW winds).

SURFACE WATER HYDROLOGY

Drainage Systems

2.152
The Western Lake Ontario drainage basin, which includes the plant site, consists of about 800 square miles. It extends 60 miles along the shore from the city of Rochester to the hamlet of Olcott. The maximum width of 24 miles extends in a north-south direction through the Oak Orchard subbasin.

2.153
The land at the Somerset Site slopes gently toward Lake Ontario with a slope of about one-foot vertical to 45 feet horizontal (1: 45). Elevation ranges from 250 to 300 feet above MSL. Two intermittent stream channels pass through the property. These are Fish Creek, 9.9 miles long with a drainage area of 9.5 square miles, and an intermittently flowing unnamed stream with a length of 2.4 miles and a drainage area of 0.9 square miles. Fish Creek and the unnamed stream pass through the south-eastern and south-central portions of the site, respectively. Both originate upland of the proposed facility boundaries and discharge into Lake Ontario. The outlet of Fish Creek is about 10,000 feet east of the proposed site, while the outlet of the intermittently flowing unnamed creek is about 1,400 feet east of the center of the site.

2.154
There is a five-acre pond, formed by the construction of an earthen dike, near the mouth of the unnamed stream. The maximum depth of the

pond is 12 feet. Although fed by waters from the creek, there was no visible discharge into Lake Ontario. A smaller pond, with an area of approximately 1,000 square feet and a maximum depth of three feet is located 4,000 feet upstream of the mouth of the unnamed creek. There are also two small ponds along Fish Creek east of Potter Road.

2.155
Runoff in the general area is slow, and thus drainage problems exist throughout the area; drainage is poorly developed and not yet fully integrated. Wet woodlands exist south of the site. Surface drainage in the site area flows directly into Lake Ontario via Fish Creek, the unnamed creek, and gullies. Drainage is somewhat influenced by bedrock jointing. This site itself, however, is well-drained.

2.156
The number of streams crossed by the proposed transmission lines, water quality standards, stream order, and drainage basin data are given in Table 2-14. No lakes or ponds are crossed by the proposed transmission lines. The stream order data provide an indication of the size, flow volume, and biological diversity of streams crossed. The number and order of streams crossed was determined from U.S. Geological Survey 7.5 Minute Series Topographic Quadrangles. The smallest headwater stream is first order. Order is increased when two streams of the same order unite, but is not increased by the entry of a lower order tributary. Low order streams are more sensitive to environmental changes than higher order streams. The grouping of streams into drainage basins follows the classification of the NYS Department of Environmental Conservation Water Quality Surveillance Network. Water quality standards were obtained from the Official Compilation of Codes, Rules and Regulations of the State of New York.

Lake Dimensions, Volume, and Bathymetry

2.157
Lake Ontario, the easternmost of the Great Lakes, is approximately 193 miles (311 kilometers) long, 53 miles (85 kilometers) in breadth, and contains 726 miles (1,168 kilometers) of shoreline including that of the islands within the lake. Its maximum depth is 802 feet (245 meters) and its overall mean depth is 283 feet (86 meters).

Lake Ontario, including the Niagara River and the St. Lawrence River above Iroquois Dam, has a surface area of 7,550 square miles (19,555 square kilometers) with a volume of 393 cubic miles (1,638 cubic kilometers). The drainage basins of Lake Ontario, the Niagara River, and the St. Lawrence River above Iroquois Dam extend over a land area of 27,200 square miles (70,488 square kilometers).

TABLE 2-14

STREAM CROSSING DATA FOR PROPOSED TRANSMISSION LINES

	Number	Percent of Total
Water Quality Standard		
Class A	2	11.1
Class B	0	
Class C	5	27.8
Class D	11	61.1
Stream Order		
1	8	44.5
2	5	27.8
3	4	22.2
4	1	5.5
Drainage Basin		
Lake Erie	3	16.7
Niagara River		
Lake Ontario	15	83.3
Western Tributaries		

2.158
The major source of inflow into Lake Ontario is the Niagara River. The average flow is about 203,000 cfs (about 80 percent of the total inflow of water into the lake). The rest of the inflow is from runoff, other rivers, and rainfall. Outflow from the lake is primarily through the St. Lawrence River, with an average discharge rate of about 241,000 cfs. Other water losses are through evaporation which amounts to about 19,000 cfs.

2.159
"Residence time," or the time required to displace the water in the lake, may be determined by using two different methods resulting in two different values. The first assumes a simple inflow of fresh or clean water replacing the water in the lake, with no mixing or loss from the lake. Under these conditions, "residence time" is 8.4 years. The second method is more realistic and considers mixing and losses from the lake. For these conditions residence time is about 21 to 22 years. Sweers (1969) estimated flushing time of the whole lake at 7.8 years and that of the epilimnion as 1.2 years (International Joint Commission, 1969).

Lake Ontario Water Levels

2.160
The immense storage capacity of the Great Lakes in combination with their restricted outflow capacities make them a highly effective, naturally regulated water system. The range of seasonal lake level variation of Lake Ontario is about 1.5 feet. The extreme variation range of Lake Ontario water level has been about 6.5 feet.

Lake level and outflow fluctuations depend on the magnitude of water supply change and the timing of the passage of the water supply through the Great Lakes system. These, in turn, are affected by natural factors including precipitation, evaporation, runoff, groundwater, ice retardation, aquatic growth, meteorological disturbances, tides, and movement, and by artificial factors including diversions, consumptive use, and regulation. Precipitation excesses or deficiencies cause long-term variations in lake levels.

2.161
Records of the Lake Ontario drainage basin (1900-1977) show the maximum annual precipitation as 44.3 inches, minimum annual precipitation as 27.6 inches, and average annual precipitation as 34.7 inches. The lake surfaces occupy about one-third of the total catchment. Evaporation excesses or deficiencies may accompany precipitation excesses or deficiencies and reinforce long-term variations in lake levels. The approximate average annual evaporation from Lake Ontario

is 25 inches (10-year period 1950-1960) which equals approximately 74 percent of the average annual precipitation on the lake. The estimated average annual runoff from the local tributary land area is 33,800 cfs (10-year period 1950-1960) (U.S. Army Corps of Engineers, 1965). The long-term average inflow to Lake Ontario from the Niagara River is about 203,000 cfs, and the long-term average discharge via the St. Lawrence River is about 241,000 cfs.

2.162
Meteorological disturbances may produce large short-term fluctuations of lake levels lasting from minutes to several days. For example, the lake surface may tilt, one end rising several feet and another end falling, as a result of sustained high winds along the lake axis. Temporary lake level fluctuations also may be produced from atmospheric pressure changes. Tides observed for many years, both solar and lunar, generally have small magnitudes.

2.163
Differential movement of the earth's crust also affects the water levels of the lake on a very small scale. This may be visualized as a lake basin tilt due to the gradual rising of its northeastern rim. Consequently water levels along the northern and eastern shores recede with respect to land. Crustal movement on Lake Ontario was estimated to be 0.62 feet/century rise at Toronto with respect to Oswego. From this analysis, and considering the lifetime of the proposed plant, crustal movement is considered negligible with respect to the Somerset Site.

2.164
Diversions, consumptive use, and regulation of water supply are artificial factors affecting lake levels. One major diversion from the Albany River Basin into Lake Superior, averaging 5,500 cfs, increases the supply to the Great Lakes. Another major diversion at Chicago from Lake Michigan into the Mississippi River Basin, with a maximum allowable amount of 3,200 cfs, decreases the supply. The net effect of these diversions has been to raise the levels of Lakes Michigan and Huron by 0.14 feet and Lake Erie by 0.09 feet. Their effect on Lake Ontario has been insignificant because its outflows are regulated. Lake Erie is not presently regulated although the possibility is being studied by the newly formed Lake Erie Regulation Study Board.

2.165
Water expended by consumptive use is water withdrawn from the lake and not returned. The effect is a reduction in net water supply to the lake and to the water levels. To eliminate this effect on the lake level, the outflow must be reduced by an amount equal to consumptive use. Consumptive use in the Great Lakes basin is expected

to increase from 2,300 cfs in 1965 to 6,000 cfs in the year 2000 and 13,500 cfs in the year 2030. Presently, Lake Ontario's consumptive use is 3,000 cfs which, due to water level regulation, produces a negligible effect on the lake level.

Lake Level Control

2.166
Moses-Saunders Power Dam usually passes the full flow of the St. Lawrence except for small diversions for navigation lockages and water supply for local domestic and industrial use. The Long Sault Dam customarily discharges no water; it serves primarily as a backup in case of mechanical failure at the Moses-Saunders Dam or in case the Board of Control mandates outflows greater than can be passed by the Moses-Saunders Dam. This occurred during certain portions of 1973, 1974, and 1976 when excessive supplies were received.

2.167
Water levels for Lake Ontario have been recorded by NOAA/National Ocean Survey at a gaging station located in the southwest corner of the Port of Oswego Authority building at the mouth of the Oswego River in the city of Oswego, NY. The period of record dates back to January 1860. The data are given according to the ILGD, 1955, which gives elevations in feet above MSL at Oswego, NY. For the period of record, the following extreme water levels have been observed.

	Elevation (feet) IGLD, 1955
Instantaneous maximum	248.96
Maximum daily average	248.25
Maximum monthly average	248.06
Instantaneous minimum	240.94
Daily minimum	241.23
Monthly minimum	241.45
Maximum monthly average since control	247.92
Minimum monthly average since control	241.78

Low water datum elevation for Lake Ontario is 242.8 feet (International Great Lakes Datum, 1955).

2.168
According to Plan 1958-D, mean monthly water levels of Lake Ontario will be maintained between elevations 246.77 feet (IGLD, 1955) and 242.77 feet (IGLD, 1955). This provides a range of stage of 4.00 feet. The St. Lawrence River Board of Control supervises Lake Ontario regulation. During the spring of 1973, 1974, and 1976, the level exceeded the maximum value, reaching elevations of 247.92, 247.47, and 247.32 feet, respectively (IGLD, 1955).

Water Elevation Under Storm Conditions

2.168a
The water elevation under storm conditions represents a complex interaction between wind and water. Wind-induced surface currents produce a piling up of water at the leeward end of the lake and a lowering of water level at the windward end with a return flow along the bottom. The term "wind setup" is used to describe this action. Additionally, storm pressure differentials and rainfall could produce an increase in local water elevation above wind setup. The estimated maximum still water level for the Somerset Site is 249.0 feet (IGLD, 1955). Runup from wave action is estimated to carry water in the vicinity of the site to about elevation 255.4 feet (IGLD, 1955). These estimates represent an increase in water level of 2.2 feet and 8.5 feet, respectively, above the planned maximum controlled water surface level of 246.8 feet (IGLD, 1955).

The generating facilities are located at the western end of the Somerset Site, which currently has the lowest existing elevation. However, the grade adjacent to the shoreline, north of the plant facilites, will be raised to approximately EL. 259 feet (IGLD) in conjuction with the construction of the plant. Because of this proposed regrading, no inundation of the site or facilites, caused by wave action, is expected to occur.

Lake Ontario Stratification

2.169
The thermal structure of Lake Ontario is continuously in a state of flux. The yearly cycle generates the greatest changes, but periodic and random disturbances of higher frequencies are superimposed upon the yearly cycle. In turn, the yearly cycle can be considered as a perturbation on long-term variations induced by changes in climate and aging of the lake. This cycle consists of two phases: the heating phase from mid-March to mid-September and the cooling phase for the remaining part of the year.

2.170
The beginning of summer is marked by the disappearance of the offshore temperature minimum in late June or early July. Also characteristic of summer is the appearance of the summer thermocline which stratifies lake waters into the epilimnion and hypolimnion. Rapid temperature changes occur across the thermocline, which has an average depth of 55.8 feet (17 meters). According to Allen, (1969) the thermocline may be defined as the depth of maximum vertical temperature gradient or the depth of the 50°F (10°C) isotherm. Summer is also characterized as the period of maximum rate of heat input. By the end of August, maximum heat storage is achieved.

During the summer, mixing is confined to the epilimnion. The warm water of this upper layer makes up only 15 percent of the volume of Lake Ontario (Casey et. al., 1973). As a result, stratification reduces the volume of water with which pollutants can be dispersed. Effective mixing within the epilimnion accounts for slightly varying surface temperatures of 64 to 70°F (18 to 21°C).

2.171
In contrast to the epilimnion, the hypolimnion is made up of relatively undisturbed cold water. Summer temperatures vary slightly and are usually about 39°F (3.8 to 4.0°C). Hypolimnion water makes up about 85 percent of the lake volume.

2.172
The transport of heat into and out of various parts of the basin is largely determined by thermocline properties and by the influence of wind stress and barometric pressure, coupled with effects of the earth's rotation. Strong winds cause upwellings at windward shores by causing displacement of the surface waters in a leeward direction, and, during summer stratification, a tilting of the thermocline. The wind stress puts the water surface and thermocline out of equilibrium; when the stress is removed, surface and internal oscillations result. The thermal response time to changes in the windfield is on the order of 36 to 48 hours (Mortimer, 1971).

2.173
Sweeney (1971) defines the onset of stratification by the appearance of the 39°F isotherm. Stratification in the vicinity of the Somerset Site was initially identified in late April by the appearance of the 39°F isotherm, and soon after by the first upwelling. Since the average depth of the thermocline, 55 feet, was below the deepest temperature sensor at the site, stratification was detected throughout the seasons only by the occurrence of upwellings. As the 39°F isotherm moved lakeward, a shallow and weak gradient thermocline developed shoreward. Weak spring upwellings brought about decreases in temperature of only 5°F. During summer, the thermocline deepened and the gradient increased. Summer upwellings often caused temperature decreases of as much as 33°F over several days. With autumn cooling, the thermocline deepened further and its gradient lessened. The site data reflect this by showing fewer upwellings, all of which had small temperature decreases of about 5°F. The lake remained stratified until the middle of November. Occasionally, weak winter inverse stratification occurred in 1973 and 1974. This was the reverse of summer stratification due to the fact that in winter, water colder than 39°F (maximum density water) floats on denser, warmer water. Inverse stratification was evidenced by the occurrence of warm water upwellings which caused small temperature inversions.

2.174
In Allen's analysis of Lake Ontario, temperature profiles taken during the stratification period provided a range of thermocline depth. The 50°F (10°C) isotherm was used to define the thermocline. The site water quality survey profiles showed that the thermocline uptilted to the surface and downtilted to a depth of 95 feet. Many profiles showed a 40 to 50-foot depth.

During stratification, the deepest monitor sensors, T8 and T4 (each one-foot above the bottom at depths of 24 and 33 feet, respectively) were located in the epilimnion. Only during upwellings did these and other sensors record temperatures of water of hypolimnetic origin.

Upwellings and Downwellings

2.175
Temperature changes associated with upwelling events were caused by uptilts and downtilts of the thermocline. Uptilts transported cold (39°F) water of hypolimnetic origin into the nearshore zone, accounting for rapid temperature decreases of as much as 10°F in one-hour. Rapid temperature decreases such as this occurred in the summer (3 September 1974, day 246), whereas spring decreases were slower (23 June 1974, day 174). As the thermocline downtilted to return to its equilibrium position, rapid temperature increases were observed as epilimnion water with seasonal temperature replaced the cold water of hypolimnetic origin. Compared to the large temperature decreases of the summer, the spring and autumn upwellings were small and caused decreases in temperature of only about 5 to 10°F (3 June 1974, day 155).

2.176
During the stratification period, upwellings were common and occurred five or more times monthly. Prominent upwellings have low temperatures near 40°F and long durations of as much as eight days occurred about once each month. In early May, upwellings lasted about one day, while in late May, the duration increased to four days. Summer upwellings were the longest, with deep sensors recording an upwelling for about eight days. Autumn upwellings were of shorter duration and similar to those of spring.

Instantaneous Lake Levels

2.177
For the purpose of this study, instantaneous lake levels provide a more meaningful measure of available water than do other parameters such as flow rates. Daily average lake levels were obtained from the Lake Survey Center gaging stations at Olcott and Rochester, NY.

2.178
The instantaneous minimum lake level recorded at Olcott for the period of record (January 1967 through June 1977) was 243.24 feet (IGLD, 1955) during December 1971. The instantaneous maximum lake level for the period of record was 248.87 feet (IGLD, 1955) during June 1973. The average lake elevation was 244.69 feet (IGLD, 1955).

Lake Currents

2.179
The currents regime at the Somerset Site was monitored from January 1974 through February 1975. The system consists of two rigid underwater platforms supporting parametric sensors wired to subsurface junction boxes. Data were transmitted to an onshore data recording center.

Throughout the year, steady speeds were never observed. Speeds occurred as series of pulses changing from calm (0.08 fps) to a maximum and back again. The single maximum current measured was 1.6 fps (the upper range of the speed sensor). The minimum current measured was the lower threshold of the current sensor, which was 0.08 fps.

Cyclical speed pulses having periodicities on the order of days were clearly seen during early spring, late autumn, and winter. These pulses were separated by calms. Summer speed periodicities of this length were partially marked by inertial oscillations of short periods (12 to 17 hours). This resulted in very irregular currents as opposed to smooth and regular spring pulses. Fewer calms occurred between pulses during the summer.

Speed pulses were associated with current direction reversals. Calms occurred at the time of reversal, and a new speed pulse followed when the direction stabilized. Causes for these pulses and reversals are discussed in the following sections.

Calms

2.180
Calms often lasted 6 to 24 hours between speed pulses, but a duration of one-hour or less was most common. During late April, numerous calms occurred together and speed pulses were low. For this analysis, a calm was defined as a period of at least one-hour with measured current speeds of 0.1 fps or less. The criterion for determining the onset of a calm was that four successive speed measurements must be 0.1 fps or less. The end of a calm was defined as the occurrence of two successive measurements greater than 0.1 fps. The longest calm observed lasted 24 hours. Winter and spring had the most calms of greatest duration. Autumn had the least number of calms.

Direction

2.181
Directions were predominantly alongshore (east-west), with east-flowing currents occurring more often than the westerly currents. This was consistent with the predominant counterclockwise circulation of Lake Ontario. An annual summary shows that about 50 percent of the time there was an east trend (east-northeast to east-southeast) and about 21 percent of the time a west trend (west-southwest to west-northwest).

Reversals

2.182
Current reversals caused abrupt shifts (180°) of alongshore flow. This shift occurred as fast as in 15 minutes or as long as in a few hours. Reversals often occurred one after another in rapid succession every 12 to 24 hours. At other times they were separated by long periods of steady, alongshore flow of 10 or more days. Most commonly, reversals occurred every three to five days.

2.183
Rotary direction shifts, instead of rapid 180° reversals, were rarely observed. June 25, 1974 is a good example of rotary currents. Currents gradually shifted in a clockwise direction from 30 to 270°. This phenomenon was associated with the first prominent 1974 upwelling. Previous research has found that inertial oscillations (diametral seiche) are mostly on the thermocline surface. As the thermocline uptilted to the depth of the site current sensors, rotary current direction shifts and/ or inertial speed and direction fluctuations were observed.

2.184
Current reversals were caused by the passing of storms and the resulting periodic lakewide behavior. The combined effect was a complex occurrence of events with clearly reoccurring periods not always apparent. Casanady and Scott (1974) associated these events with internal boundary waves (Kelvin waves) rotating around the lake in the nearshore zone. These waves were initiated by a wind stress which causes a rapid speed pulse and alongshore direction flow in rapid response to wind. When the wind stress decreased, the set up wave form moved alongshore, causing the current to reverse until another wind impulse arrived.

Visual comparisons of site wind and currents showed that reversals and associated flow were a result of the combined effects of changing wind stress and lakewide periodic wave behavior. Both cause reversals, but the balance between the two was important to the net

result. Often currents reversed to produce flow in the opposite direction to a wind stress. Similarly, where an internal wave should have caused a reversed current flow, a large wind stress in the opposing direction prevented the reversal.

Periodicities

2.185
Periodicities were expressed by currents as speed pulses and direction reversals. They were caused by wind stress, internal boundary waves with periods of 12 to 16 days, and inertial waves (seiches) with periods of 12 to 17 hours. Long periodicities occurred throughout the year, while inertial periods were most numerous during the summer and rare during the remainder of the year.

More periodic behavior was observed in records of current speed than in those of direction or temperature. Speed data show both long periods and inertial periods. Direction data showed mostly long periods; however, during upwellings inertial periods were expressed as reversals or small direction shifts. Long periods were on the order of days. They were associated with passing storms which typically have a period of three to eight days and, most likely, with internal boundary waves with a period of 12 to 16 days. The distinction could not be made in the data between a recurrent event of a period of 16 days that had rotated completely around the lake, and the initiation of a new current event and the resulting internal boundary wave. Only net results of numerous activities were observed.

Onshore-Offshore Currents

2.186
The 1974 data showed that onshore-offshore currents occurred during a very small percentage of the time, and when observed they had low speeds and short durations, and often were not a steady flow. Current distribution tables summarized in detail for each month the percent occurrence of onshore and offshore currents for speeds of less than 0.1 fps to greater than 0.9 fps. Annually, onshore currents occurred only 1.2 to 2.2 percent of the time for all sensors, with most having a speed of 0.08 to 0.2 fps. Offshore currents occur only 0.4 to 4.6 percent of the time, with most having speeds of 0.08 to 0.2 fps.

2.187
Many onshore-offshore flows were observed as short occurrences during upwellings and as suppressed reversals in early September and late November. Onshore-offshore flows associated with upwellings were not

steady. Onshore flows measured by sensor M1-2 during 13-16 July 1974 preceded a minor upwelling, as the thermocline uptilted water of hypolimnetic origin flowed onshore into the monitor area. When water of hypolimnetic origin was in the site area, return offshore flow began. This general relationship was seen during upwellings later in July. Suppression of current reversals by wind stress caused near onshore currents in one example in September.

Vertical and Horizontal Variation

2.188
Continuous plots of current speed and direction and annual and monthly current distribution tables were used to compare sensors between towers and with depth at each tower. Generally, speed pulses and direction reversals were measured at the same time by all sensors. Speeds were higher offshore than nearshore for currents closer to the surface. Deeper currents compared well between offshore and nearshore. Sensor M2-1, the deeper sensor on the offshore tower, often measured the highest speeds. More calms occurred in the nearshore sensor area which was farther from the influence of the maximum coastal jet velocity.

2.189
For near surface current directions, the nearshore currents were more easterly than offshore directions. For deeper currents, nearshore currents again were more easterly than the offshore currents which, for the year, were more toward the east-northeast. Speeds were faster nearer the surface. Deeper sensors for both towers had more calms due to less wind influence.

2.190
During stratification, deeper sensors at both towers had more unstable currents with more shifts and reversals, rotary currents, and inertial pulses. For the nearshore tower, the near surface currents were more easterly than deeper currents. For the offshore tower, the near surface currents again were more easterly and the deeper currents were more east-northeast.

Summary of Causative Factors

2.191
The annual warming and cooling cycle was responsible for observed sesonal temperature changes as well as the development and deterioration of stratification. Upwellings were caused by the combination of a wind stress and the internal boundary wave it set in motion.

2.192
The internal boundary wave moving past the site caused downtilting and uptilting of the thermocline. Upwelling typically lagged the generating wind event by about 36 hours or less. Inertial oscillation (seiche, Poincare waves) caused small fluctuations of the thermocline seen as small temperature perturbances during an upwelling.

2.193
Currents were predominantly caused by major wind stress and associated boundary dependent, lakewide, periodic behavior. Internal boundary waves, decreases of wind stress pulses, and near 180 degree shifts in wind direction were responsible for current reversals. A balance evidently existed between the magnitude of wind and boundary wave effect on currents. Winds were seen to complement internal boundary waves, which resulted in a normal, distinct reversal. Winds also countered the internal boundary wave. In this case, when the winds were weak, the boundary wave caused currents to reverse and flow in the opposite direction to wind stress. When winds were stronger than the boundary wave effect, a reversal was suppressed and a small shift of direction was observed.

2.194
Inertial oscillations with periods of 12 to 17 hours (seiche, Poincare waves) were responsible for small scale speed fluctuations of the same period during upwellings. Associated with these small speed fluctuations were unstable directions due to rapid, short duration (12 to 17 hour) reversals and rotary direction shifts.

2.195
Although internal boundary waves and inertial oscillations were observed, there were several factors that made their observation difficult. Winds may have a greater influence on shallow, nearshore water, thus masking internal wave effects. A succession of wind pulses caused complicated overlapping of idealized events. Finally, frictional interactions between water and shore boundary (for nearshore sensors), as well as water and lake bottom (for deeper sensors), added additional complexities.

Minimal Mixing

2.196
Minimal mixing resulted in low alongshore transport. Minimal mixing was defined as a condition during the spring thermal bar regime when current velocity was minimal. The thermal bar was first detected on 22 April. The resulting spring thermocline produced nearshore horizontal and vertical thermal stratification, which effectively diminished vertical mixing as well as the mixing of nearshore water with

offshore water. This extreme condition occurred 20 April to 6 May 1974, at the Somerset Site. Measured current velocities ranged from 0.08 fps to 0.6 fps and were a direct result of wind speeds less than 10 mph. Numerous calms existed until a large speed pulse on 6 May ended the period.

Coastal Jet

2.197
A wind from the west would produce wind stress causing Ekman transport to force heated surface water toward the south shore to build up and form strong coastal currents, called coastal jets, from the west. Examination of 1972 IFYGL coastal chain current data at Olcott, NY, illustrated the relationship of the coastal jet to the south shore. Olcott is only five miles west of Somerset and the currents at the two sites were found to be similar. The coastal jet observed at Olcott is likely to be very much the same as the coastal jet at Somerset.

At Olcott, observations showed that the maximum coastal jet velocities were located about two to three miles (9,800 to 16,500 feet) offshore. Assuming the same to be true at Somerset, currents measured by the monitors were inshore of the coastal jet maximum velocity region. The coastal jet often drifted within the nearshore zone in response to wind direction and may have drifted inshore within the range of the Somerset monitors.

2.198
Speeds at the Somerset monitors were higher offshore than nearshore for current closer to the surface, and fewer calms occurred offshore. These variations may have been the result of coastal jet influence.

Depth Profile

2.199
Figure 1-5 illustrates the depth profile of the Somerset Site with the intake and discharge structures superimposed at their intended locations.

PRESENT WATER QUALITY

2.200
During the data base year, January 1974 through January 1975, the physical, chemical, and bacterial analysis of Lake Ontario waters in the immediate vicinity of the Somerset Site (near-field) was accomplished in order to establish the baseline water quality condition. Certain pertinent information on far field water quality, secondary water source water quality, and on water quality data

collected during the data base year is presented. Sampling station locations and the locations of two under-water monitoring platforms are shown in Figure 2-11. These monitoring platforms were used to measure current speed and direction and water at various depths. Water quality sampling was generally conducted on three transects (perpendicular to shore) at three cross-sections (parallel to shore). This grid results in nine sampling stations. The inshore stations were sampled at the surface, the middle cross section at the surface, and 25 feet deep, and the outer cross section at the surface, 25 feet and 50 feet deep. This array of stations covers an area of two square miles, extending one-mile offshore and one-mile to either side, centered on the site. Table 2-15 provides a summary of observed maxima and minima for water quality parameters by month.

Physical Parameters

2.201
Physical water quality parameters measured during the study of the Somerset Site included water temperature, turbidity, and suspended solids. Figure 2-12 presents the surface temperatures observed at the Somerset Site from August 1972 through January 1975. During the study, maximum temperatures of 75 to 80°F were observed in July and August 1973. Temperatures steadily declined through the fall of 1973, reaching essentially freezing temperatures along the shore in early January 1974 (32°F observed on 3 January) and at the monitor towers during the period of 8 to 18 January. Sharp surface temperature decreases were observed on several occasions during 1974. These temperature decreases may indicate the occurrence of upwellings.

2.202
During the data base period, temperatures of surface water measured near the shore (Station 51) were nearly identical to those measured one-mile out from shore with the exception of one instance in August when temperatures observed near shore were lower than those at the outer station (Station 53).

2.203
A comparison of selected water quality parameters including temperature from the site and the farfield (Lyndonville Pumphouse, 15 miles east of the site and Olcott, 5.5 miles west of the site) indicate that the site is very similar to the rest of the water body along this portion of the Lake Ontario shoreline.

Turbidity, Suspended Solids, and Transparency

2.204
Turbidity levels during the data base year ranged from 0.2 JTU (Jackson Turbidity Unit) to 74 JTU at Transect 5. Suspended solids

FIGURE 2-11

WATER QUALITY SAMPLING STATIONS

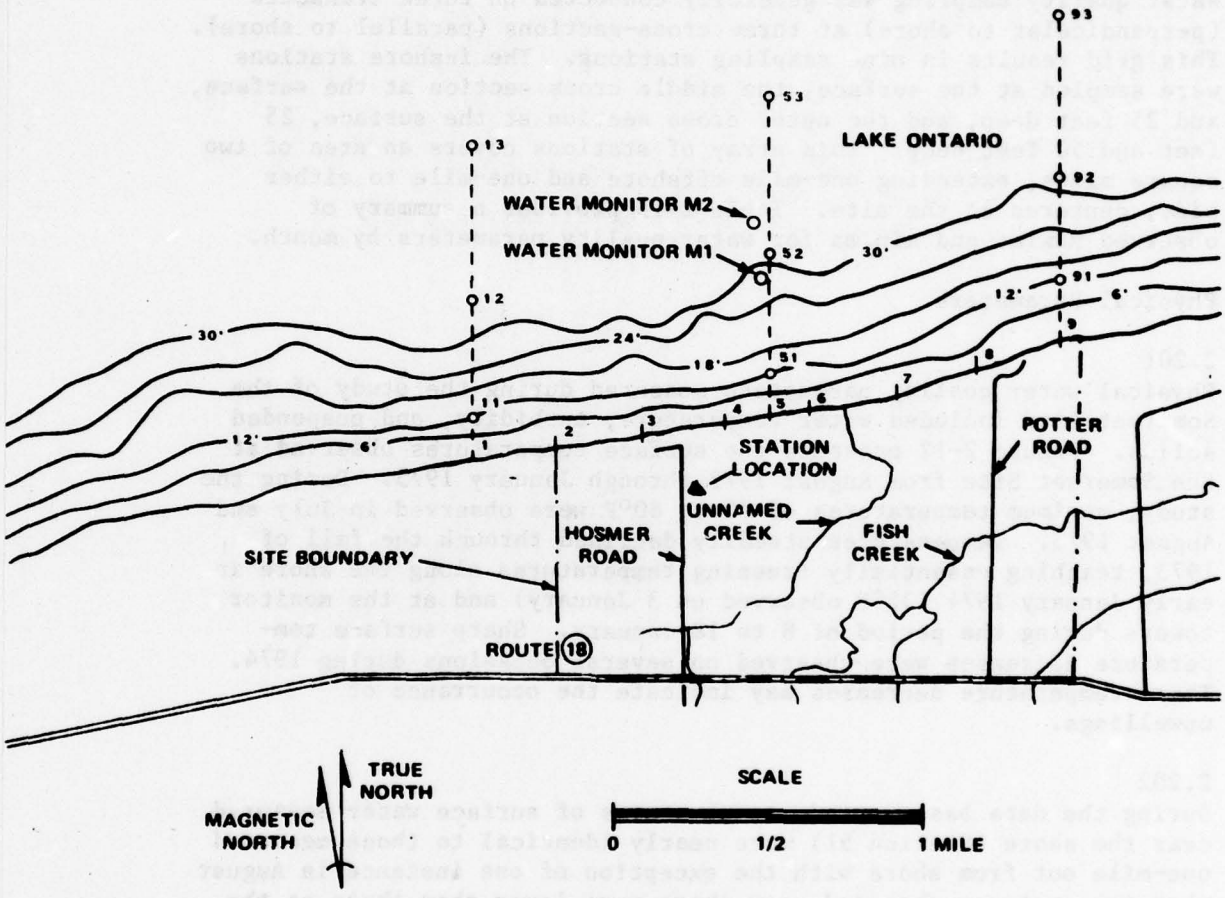


TABLE 2-15 (Sheet 1 of 3)

WATER QUALITY SUMMARY SOMERSET SITE, 1974-1975 STUDY RANGES[a]

Parameter	1974 January	February	March	April	May	June	July	August	September
Soluble Silica (Si)	0.30-2.00	0.54-0.67	-	0.03-0.30	0.01-0.02	<0.01-<0.01	<0.01-<0.01	0.02-0.12	<0.02-0.07
Inorganic Carbon	20-22	20-21	-	19-21	18-21	21-22	18-20	17-19	21-22
Organic Carbon	5-7	5-6	-	4-8	3-7	4-5	7-8	2-11	2-4
Aluminum	0.6-2.8	0.7-1.6	-	<0.1-1.6	-	-	<0.1-0.4	-	-
Total Iron	0.77-3.26	0.71-1.37	-	0.12-1.82	0.12-0.23	0.05-0.25	<0.02-0.27	<0.02-0.13	0.02-0.09
Manganese	0.02-0.07	0.03-0.06	-	<0.02-0.04	<0.02	-	-	-	-
Mercury[b]	<0.3-<0.7	0.7-2.4	-	<0.2-1.0	<0.2-1.6	<0.2-3.0	<0.2-2.5	<0.2-1.2	<0.2-<1.1
Nickel	0.03-0.06	<0.02	-	0.02-0.05	-	-	<0.02	-	-
Zinc	0.04-0.07	0.03-0.10	-	<0.02-0.20	-	-	<0.02-0.11	-	-
Dissolved Solids	187-254	204-252	203-205	184-234	180-211	179-215	184-215	182-213	163-213
Specified Conductance[c]	327-410	292-328	-	293-374	296-306	325-337	302-351	298-315	303-311

Parameter	1974 October	November	December	1975 January	February	March	1974-75 Study Minimum	1974-75 Study Maximum
Soluble Silica (Si)	<0.01-0.01	0.03-0.08	<0.01-0.06	-	-	-	<0.01	2.00
Inorganic Carbon	22-22	22-23	22-24	-	-	-	17	24
Organic Carbon	4-5	3-5	4-5	-	-	-	2	11
Aluminum	<0.1-<0.2	-	-	-	-	-	<0.1	2.8
Total Iron	0.6-0.08	0.13-0.30	0.10-0.29	-	-	-	<0.02	3.26
Manganese	<0.02	-	-	-	-	-	<0.02	0.07
Mercury[b]	<0.2-5.3	<0.2-<2.1	<0.02	-	-	-	<0.2	5.3
Nickel	<0.02	-	-	-	-	-	<0.02	0.06
Zinc	<0.02-0.07	-	-	-	-	-	<0.02	0.20
Dissolved Solids	175-207	169-209	141-196	179-235	190-220	184-227	141	254
Specific Conductance[c]	310-320	300-337	320-330	-	-	-	292	410

a. All values are in mg/l unless otherwise noted.
b. Measured in ug/l.
c. Measured in umhos/cm at 25°C.

TABLE 2-15 (Sheet 2 of 3)

Parameter	1974 January	February	March	April	May	June	July	August	September
Total Phosphate (P)	0.05-0.12	0.06-0.25	-	0.02-0.06	0.02-0.03	0.01-0.04	0.01-0.09	<0.01-0.03	0.01-0.04
Turbidity (JTU)	22.0-95.0	23.7-40.7	-	0.8-33.0	3.4-6.6	0.5-4.3	0.1-6.0	1.0-2.3	0.4-0.7
Suspended Matter	18-99	20-42	-	4-41	3-12	2-55	2-15	<1-2	<1-4
Biochemical Oxygen Demand, BOD	<1-2	<1-3	<1-<1	<1-1	<1-2	<1-3	<1-2	<1-2	<1-5
Chemical Oxygen Demand, COD	9-11	9-12	-	6-11	-	-	6-11	-	-
Water pH	6.9-7.8	7.4-8.0	7.7-7.7	7.4-8.0	7.5-8.3	7.3-8.0	7.7-8.1	7.5-8.4	7.7-8.2
Methyl Orange Alkalinity[d]	83-94	87-93	-	89-97	78-91	76-87	82-92	83-94	89-94
Total Acidity[d]	2-4	5-6	-	3-7	3-11	4-8	2-5	1-4	2-2
Nitrate (N)	0.9-2.1	0.7-1.0	-	0.2-1.1	0.7-1.2	<0.2-1.5	<0.2-0.8	<0.2-0.4	<0.2-<0.2
Kjeldahl Nitrogen	0.27-0.55	0.35-0.47	-	0.15-0.70	0.13-0.42	<0.10-0.86	<0.10-0.60	0.18-0.31	0.19-0.39
Orthophosphate (P)	0.02-0.03	0.03-0.04	-	<0.01-0.01	<0.01-0.01	<0.01-0.01	<0.01-0.01	<0.01-0.01	<0.01-<0.01
Total Silica	2.73-17.73	4.67-8.07	-	1.05-11.33	-	0.24-1.90	<0.04-0.90	0.04-0.76	0.14-0.26
Sodium	13-14	13-14	-	11-14	-	-	13-14	-	-
Chloride	25-27	26-28	-	22-28	-	-	25-28	-	-
Sulfate	9-18	10-11	-	8-11	9-9	8-9	8-9	7-9	8-9
Oil and Grease	<0.003-0.217	<0.003-0.541	-	<0.003-<0.003	-	-	<0.003-0.080	-	-
Total Coliforms[e]	370-12,000	400-860	-	44-730	130-750	10-65	2-220	27-8,500	22-320
Fecal Coliforms[e]	31-230	47-56	-	2-46	43-91	5-31	0-52	0-32	2-41
Calcium	35-40	35-36	-	35-41	36-38	30-36	31-39	35-41	34-41
Magnesium	7.6-9.0	7.4-7.6	-	7.5-8.9	7.6-8.0	7.8-8.8	6.9-8.3	7.4-7.9	7.7-8.3
Hardness[d]	119-136	118-121	-	119-146	122-128	110-123	111-128	118-133	120-137

d. Measured in mg/l as $CaCO_3$.

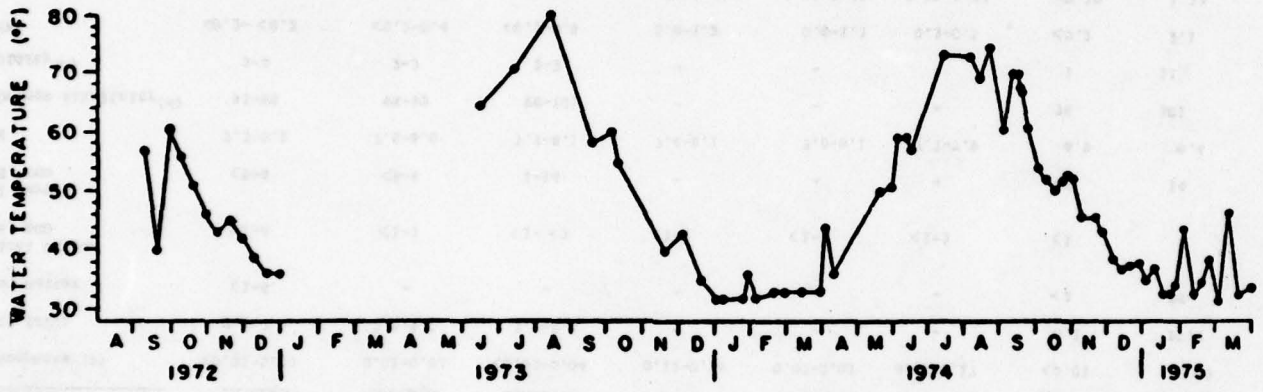
e. Measured in colonies per 100 ml.

TABLE 2-15 (Sheet 3 of 3)

Parameter	1974 October	1974 November	1974 December	1975 January	1975 February	1975 March	1974-75 Study Minimum	1974-75 Study Maximum
Total Phosphate (P)	<0.01-0.02	0.01-0.03	<0.02-0.04	0.12-0.16	0.07-0.07	0.13-0.17	<0.01	0.25
Turbidity (JTU)	0.2-2.3	2.0-5.0	3.0-8.0	-	-	-	0.1	95.0
Suspended Matter	<1-6	-	-	-	-	-	<1	99
Biochemical Oxygen Demand, BOD	<1-4	<1-3	<1-<2	<1-2	<1-3	<1-3	<1	5
Chemical Oxygen Demand, COD	<5-6	<5-9	5-14	-	-	-	<5	14
Water pH	7.3-8.1	7.8-8.0	7.7-8.1	7.4-8.1	7.8-8.1	7.7-7.9	6.9	8.4
Methyl Orange Alkalinity[d]	93-98	95-99	98-101	-	-	-	76	101
Total Acidity[d]	3-4	2-2	2-3	-	-	-	1	11
Nitrate[N]	<0.2-<0.2	<0.2-0.4	<0.2-0.6	1.0-1.2	0.6-1.3	0.3-0.5	<0.2	2.1
Kjeldahl Nitrogen	0.16-0.45	0.18-0.34	0.22-0.34	0.38-0.47	0.31-0.41	0.51-1.33	<0.10	1.33
Orthophosphate (P)	<0.01-0.01	<0.01-0.01	<0.01-0.02	0.02-0.03	0.01-0.01	0.02-0.03	<0.01	0.04
Total Silica	0.32-0.58	0.62-2.06	0.66-2.11	-	-	-	<0.04	17.73
Sodium	11-11	-	-	-	-	-	11	14
Chloride	22-24	-	-	-	-	-	22	28
Sulfate Concentrations	8-9	8-9	8-9	-	-	-	7	18
Oil and Grease Concentrations[b]	-	-	-	-	-	-	<0.003	0.541
Total Coliforms[c]	94-950	1900-4800	200-550	220-290	56-110	0-2	0	12,000
Fecal Coliforms[c]	1-23	3-18	32-340	18-22	22-41	0-1	0	340
Calcium	17-40	35-41	38-41	-	-	-	30	41
Magnesium	8.0-8.2	7.7-8.4	8.2-8.4	-	-	-	6.9	9.2
Hardness[d]	127-135	119-136	130-136	-	-	-	110	146

FIGURE 2-12

AVERAGE SURFACE WATER TEMPERATURES
(°F) IN LAKE ONTARIO, 1972 - 1975



concentrations for the same period were less than one mg/l. The data collected show relatively large variations in time and space and the expected high correlation between turbidity and suspended solids measurements. Generally, higher turbidity was observed at the nearshore stations, probably due to wave action in the shore zone. Depth trends in turbidity were not consistent and the differences between depths and between transects were small relative to nearshore-farshore differences. Secchi disc data are in general agreement with the measurements of turbidity and suspended solids. Maximum water transparency (Secchi depth up to 12 feet) was observed during the summer months and at the offshore stations. The values of the various turbidity-transparency parameters measured at the Somerset Site are generally below levels considered deleterious to aquatic biota (National Academy of Sciences and Engineering, 1973).

Dissolved Oxygen-Oxygen Demand System

2.205
Dissolved oxygen (DO) tends to remain near the saturation level in Lake Ontario at all depths. In the deepest water, the lowest value was 82 percent of saturation in mid-September (Chawla, 1971). According to Casey. et al, (1973) the high levels in the hypolimnion indicate that the lake is oligotrophic. Since 85 percent of the lake water mass is below the thermocline, a large oxygen reserve is available throughout stratification. Somerset Site studies also indicate nearsaturation levels with dissolved oxygen concentrations ranging from 8.0 to 14.0 mg/l. Slightly reduced DO values observed at inshore stations in summer are generally temperature-related. Average surface DO levels at the Somerset Site for June 1973 through January 1975 were between 7.3 and 14.5 mg/l. Variations in DO with respect to depth during the stratified season indicated virtually no depletion in DO with depth. All observations of DO were well above the New York State minimum standard of 5.0 mg/l.

2.206
Near saturation DO levels were observed during all seasons, and temperature appears to be the major environmental factor influencing DO levels. Fluctuations in DO, such as observed in early February, mid-March, and mid-April 1974, represent short-term deviations from the normal nearsaturation DO levels. These reductions are probably related to wave induced scouring of bottom and shore deposits, and resultant suspension of oxygen-demanding materials during these periods.

The high DO levels observed during all seasons in the vicinity of the Somerset Site are indicative of good water quality conditions and low levels of organic pollution and production. Measurements of five-day

biochemical oxygen demand (BOD_5) and chemical oxygen demand (COD) support this conclusion. During the data base year, BOD levels ranged from one to three mg/l. Chemical oxygen demand (COD) levels near the site varied from 5 to 14 mg/l.

pH

2.207
Observed pH values at the Somerset Site ranged from 6.9 to 8.5 during the 1974-1975 survey period. Lake Ontario waters are thus slightly alkaline. The seasonal cycle of pH indicates winter minimum levels around 7.5 and late summer levels between 8.0 and 8.5. This temporal pattern is associated with the seasonal cycle of water temperature and algal photosynthesis.

In general, during the warmer month, higher pH levels were observed in farshore areas than were found in the nearshore zone. This may be due to suppressed primary production in the nearshore zone due to wave action and lower water transparency. Decreases in pH with depth are also related to reductions in primary production with depth.

Nutrients

2.208
Nutrient levels measured during the data base year include: Kjeldahl nitrogen, nitrite nitrogen, and nitrate nitrogen; total phosphate and soluble orthophosphate phosphorus; total silica and soluble silica; inorganic carbon and organic carbon. Ammonia nitrogen may be subtracted from Kjaldahl nitrogen to express organic nitrogen levels.

Nitrogen

2.209
Nitrogen is an essential element for aquatic productivity. The chemical and biological state of the aquatic system determines the relative presence of the various nitrogen compounds. Ammonia, nitrite, nitrate, and Kjeldahl nitrogen were determined during the study on Lake Ontario at the Somerset Site.

Ammonia and nitrite concentrations were usually at or below detectable concentrations. Nitrogen at the Somerset Site was thus dominated by nitrate and organic nitrogen. The mean surface values ranged from 0.2 to 1.3 mg/l and 0.3 to 0.4 mg/l, respectively. Spatial variation in nitrate nitrogen was small during the 1974-1975 study period. Nearshore-farshore differences were generally less than 0.2 mg/l as N. Differences between surface and bottom water concentrations were slightly larger and ranged up to 0.8 mg/l. Nitrogen

is not considered to be a limiting nutrient in Lake Ontario at the Somerset Site.

2.210
A lack of association at the Somerset Site between indicated algal utilization of nitrate nitrogen during the summer and autumn and the level of Kjeldahl nitrogen (a measure of organic plus ammonia nitrogen) was observed. This could indicate rather low levels of organic production near the site. In addition, the collected data imply the influence of lakewide circulation and indicate that the Somerset Site area is not isolated to the extent that a local completion of a nitrogen cycle is observed.

Phosphorus

2.211
Levels of total phosphate phosphorus and soluble orthophosphate phosphorus at the Somerset Site were determined during the 1974-1975 study. The seasonal cycle of both of these phosphorus compounds exhibited relatively high levels during the winter, and low levels during spring through autumn. Ortho and total phosphate in surface waters ranged from 0.01 to 0.03 mg/l and 0.01 to 0.14 mg/l, respectively. Spatial trends in soluble orthophosphate phosphorus concentration at the Somerset Site were negligible. Nearshore to farshore and surface to bottom differences were usually zero. Spatial variation in total phosphate phosphorus concentration was also small. The largest observed spatial gradients were in the nearshore-farshore dimension. Concentration differences between nearshore and farshore stations ranged up to 0.03 mg/l as P. Since the highest total phosphate phosphorus levels were observed in the shore zone, the observed spatial gradients were attributed to shore zone turbulence.

2.212
Casey, et. al.,(1973) concluded that phosphorus is the limiting nutrient in Lake Ontario. The data collected at the Somerset Site thus indicate that phosphorus is likely to limit aquatic primary productivity, as values less than 0.01 mg/l soluble orthophosphate phosphorus (as P) were common throughout the growing season.

Silica

2.213
Total and soluble silica were determined during the 1974 study of the Somerset Site. The seasonal pattern of both parameters is characterized by relatively high winter levels due to lake turbulence and ice scouring, following by a decline through the growing season. This pattern is probably associated with uptake by diatoms.

2.214
Replicate mean total silica concentration ranged from 0.04 to 17.73 milligrams Si/l (Table 2-16). Spatial variations of total silica concentrations appear to be related to shore zone turbulence as higher levels were generally observed at the nearshore stations. The largest observed spatial gradients in total silica concentrations were in the nearshore-farshore dimension. Differences between nearshore and farshore stations ranged up to 9.80 mg/l as Si. Differences between surface and bottom samples ranged from 0.0 to 1.18 mg/l total silica as Si.

2.215
Replicate mean soluble silica concentrations varied from 0.01 to 2.0 milligrams Si/l. Soluble silica levels less than 0.23 mg/l as Si are considered to be limiting to the growth of at least some diatom species (Lund, 1954). Data collected at the Somerset Site indicate that diatoms, which exhibit a spring peak density, deplete the soluble silica to levels which possibly limit diatom productivity through the remainder of the growing season.

Carbon

2.216
During the data base year, inorganic and organic carbon levels were determined. The observed temporal variability of these parameters was small. Mean surface inorganic carbon levels ranged from 18 to 23 mg/l as C. Mean organic concentration at the surface ranged from three to seven mg/l as C. These data indicate low levels of organic production at the Somerset Site during the season.

Data collected at the site indicate that inorganic carbon levels are not appreciably affected by algal production during the growing season. Hence, carbon is not a limiting factor in aquatic productivity at the site.

Trace Metals

2.217
Trace metal concentrations measured at the Somerset Site include aluminum, beryllium, cadmium, hexavalent chromium, total chromium, copper, soluble iron, total iron, lead, manganese, mercury, nickel, tin, and zinc. Concentrations of cadmium, hexavalent chromium, total chromium, soluble iron, lead, and tin were below detectable limits during the 1972-1974 period. Beryllium analyses were made in July and October 1974, but the concentration was below the level of detection in all samples. Survey results for the other trace metals considered are summarized in Table 2-16. In general, trace metals in

TABLE 2-16

MONTHLY MEAN CONCENTRATIONS (mg/1) OF TRACE METALS
IN LAKE ONTARIO AT THE SOMERSET SITE, 1972 - 1974

Parameter	Month - Year								
	8-72	10-72	12-72	4-73	5-73	6-73	7-73	8-73	10-73
Aluminum	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1
Copper	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron - total	0.04	0.04	0.27	0.16	•0.28	0.07	0.46	0.03	0.04
Manganese	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02
Mercury[a]	8.6	3.7	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.8
Nickel	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02
Zinc	0.03	0.04	<0.02	<0.02	<0.02	<0.02	0.04	-	<0.02

Parameter	Month - Year							
	1-74	2-74	4-74	5-74	6-74	7-74	8-74	9-74
Aluminum	1.5	1.3	0.4	-	-	0.2	-	-
Copper	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron - total	1.70	1.00	0.48	0.16	0.11	0.10	<0.04	0.04
Manganese	0.03	0.05	0.02	-	-	0.02	-	-
Mercury[a]	<0.4	1.4	<0.4	<0.4	<0.8	<0.8	<0.4	<0.4
Nickel	0.05	<0.02	<0.03	-	-	<0.02	-	-
Zinc	0.03	0.05	0.05	-	-	0.04	-	-

Parameter	Month - Year		
	10-74	11-74	12-74
Aluminum	<0.01	-	-
Copper	<0.02	<0.02	<0.02
Iron - total	0.09	0.23	0,20
Manganese	<0.02	-	-
Mercury[a]	<1.2	<0.3	<0.2
Nickel	<0.02	-	-
Zinc	<0.03	-	-

a. Mercury concentration measured in ug/1.

Lake Ontario at the Somerset Site were observed in concentrations which are low and did not approach published lethal levels. Highest levels were associated with periods and locations of relative high turbulence and turbidity.

Other Water Quality Constituents

2.218
Parameters measured as indicators of general water quality included total dissolved solids, specific conductance, calcium, magnesium, sodium, chloride, sulfide, sulfate, oils, phenolic compounds, and surfactants (MBAS). The data collected indicate good water quality in Lake Ontario in the vicinity of the Somerset Site, and generally small temporal and spatial variation in water quality.

Present Sources of Pollution

2.219
Depending on the current direction, the Somerset Site can be downstream from two major sources of pollution: The Niagara River located about 25 miles to the west and the Genesee River located about 60 miles to the east. Other small sources occur along the southern shore of Lake Ontario. Eighteenmile Creek empties into Lake Ontario at Olcott, five miles west of the site. This creek, with an estimated flow of 94 cfs, is heavily laden with domestic sewage and industrial wastes from the community of Lockport and nearby industries. The possible influence of the Eighteenmile Creek discharge should be considered. The discharge could be transported to the site area when an alongshore current is produced by westerly winds.

Several small streams discharge to the lake between Eighteenmile Creek and the Genesee River at Rochester. These streams have little influence on the lake but do contain high nutrient levels and organic wastes from seasonal canning operations. In the summer of 1964, an algal bloom (Ankistrodesmus and Scenedesmus) of 84,000 cells per milliliter was recorded adjacent to Johnson Creek (located about 16 miles east of the Somerset Site). Concentrations of sulfate as high as 200 mg/l originate from gypsum mining in the Oak Orchard Creek watershed each spring. Although some of these minor tributaries are heavily laden with wastes, the relatively small magnitude of their discharges (estimated at 126 and 288 cfs for Johnson Creek and Oak Orchard Creek respectively) and their distances from the Somerset Site indicate that their influence on the water quality in the vicinity of the site is small.

2.220
Current velocities measured at the Somerset Site monitoring stations (Figure 2-11) are most commonly in the range of 0.1 to 0.3 fps (1.6 to 4.8 miles per day). Although stable current conditions may continue for seven to ten days, their duration is usually shorter. These data indicate that the direct influence on the water quality at the Somerset Site from discharges of the Niagara River and the Genesee River-Rochester area is probably a rare event because of the distances involved. The impact of such a rare event would be diminished due to dilution and natural stabilization processes which would occur between these discharges and the Somerset Site.

AQUATIC ECOLOGY

Biological Interrelationships

2.221
Six major taxonomic groups of algae were found at the Somerset Site. Cyanophyta, or blue-green algae, flourish in warm nutrient-rich water, but usually only after the nutrients are bound into organic form by other algae. Cyanophytes often produce nuisance water blooms in late summer, and a bloom has been observed at the Somerset Site.

Seasonal succession varies from year to year, according to weather conditions and a complex array of interacting environmental factors. Trends in Lake Ontario's phytoplankton seem to indicate a tendency toward eutrophication over the years, but this is difficult to document because of the normally large variations between seasons and years.

2.222
Four major groups of zooplankton were found at the Somerset Site: protozoans, rotifers, cladocerans, and copepods.

The distribution of various Protozoa generally corresponds with the availability of essential nutrients or a preferred food type. The richest fauna is associated with shoreline areas. Surfaces of filamentous plants and algal and bacterial aggregations form excellent substrates for protozoan associations. Relationships involving animal surfaces also exist. The occurrence of Vorticella and Epistylis on the gill plates of Gammarus is a good example.

2.223
Although the Somerset benthos may best be classified at mesotrophic, it is a healthy fish environment, and productive in terms of benthic fish food organisums, the most important being amphipods (Gammarus), and crayfish.

2.224
The benthic green alga Cladophora provides habitat for numerous organisms, and is the principal primary producer at the Somerset Site. The most important ecological functions of the littoral zone and associated Cladophora beds at the Somerset Site may be fish spawning and feeding; however, such spawning and feeding activity are not limited to the site area.

2.225
Summer spawning at Somerset Site is dominated by the alewife, which spreads its eggs over the bottom and Cladophora mats between the shoreline and 10 to 15-foot depth contours. Although the rainbow smelt spawns primarily in rivers, some spawn along shore. White perch and other species spawn, to a lesser degree, at the site. There is no evidence that fish spawning is more intensive at the site than at other sections of the lake shore.

2.226
Phytoplankton and Cladophora are the major primary producers in the trophic structure at Somerset Site, with Cladophora prevalent only for a few months each year. Benthic invertebrates feed on live plankton, Cladophora, small organisms associated with the substrate and organic detritus. Some of the larger invertebrates are predatory on smaller invertebrates.

2.227
Benthic macroinvertebrates, especially crayfish and amphipods, are the primary food of the bottom fishes such as white perch, white sucker, and yellow perch, and also enter the food chain of piscivorous fish such as coho and chinook salmon (Figure 2-13). However, these salmon feed primarily on alewife, and to some degree on smelt, as in Lake Michigan.

Larval fish, alewife, and smelt feed predominantly on the crustacean zooplankton. Smelt also ingest fish and benthic macroinvertebrates.

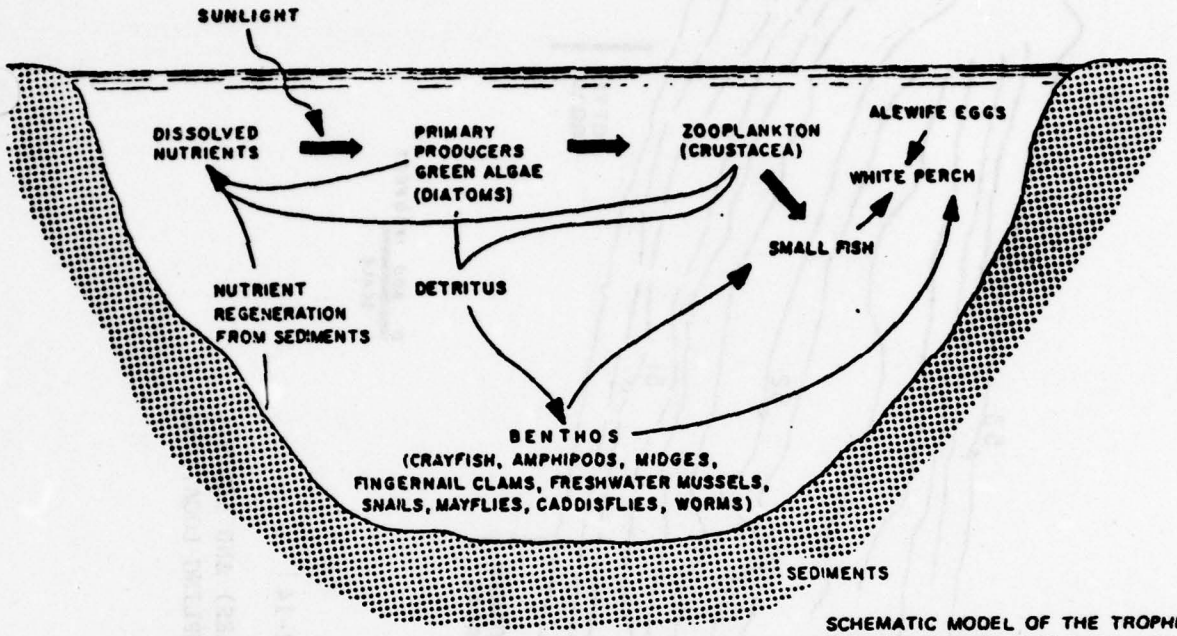
2.228
The aquatic ecology field sampling program conducted at the Somerset Site covers the period February 1974 through January 1975. Sampling locations are detailed in Figure 2-14. The aquatic ecology studies covered each of the major biotic subdivisions as well as important interrelationships.

Phytoplankton

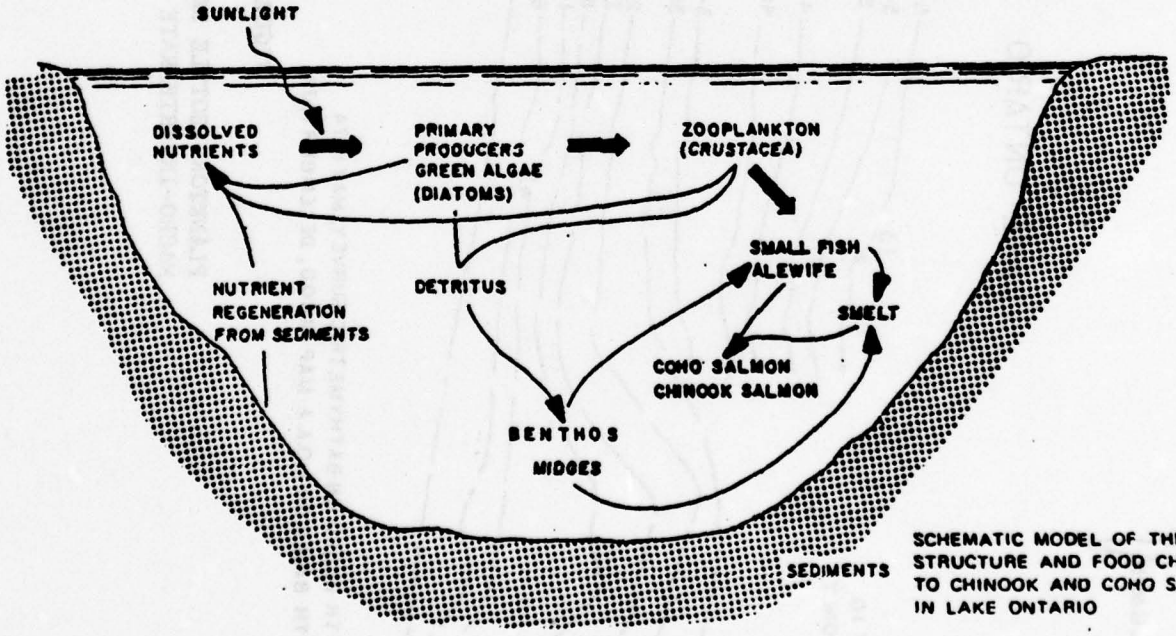
2.229
Approximately 276 taxa were identified from bottle samples collected at the Somerset site during the data base year. Chlorophytes had the

FIGURE 2-13

SCHEMATIC MODELS OF THE TROPHIC STRUCTURES AND FOOD CHAINS LEADING TO WHITE PERCH, AND CHINOOK AND COHO SALMON IN LAKE ONTARIO



SCHEMATIC MODEL OF THE TROPHIC STRUCTURE AND FOOD CHAIN LEADING TO WHITE PERCH IN LAKE ONTARIO



SCHEMATIC MODEL OF THE TROPHIC STRUCTURE AND FOOD CHAIN LEADING TO CHINOOK AND COHO SALMON IN LAKE ONTARIO

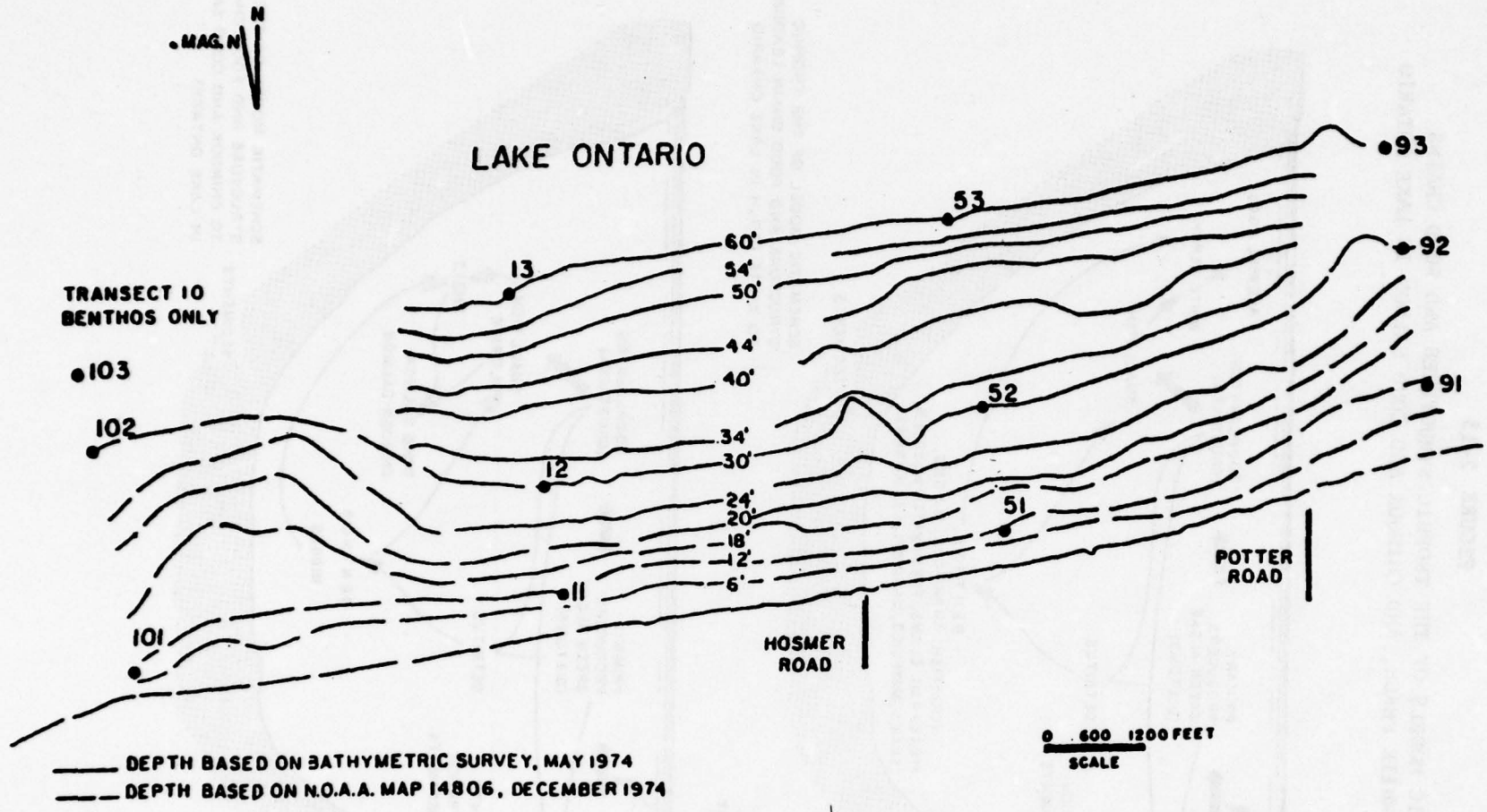


FIGURE 2-14

PLANKTON (BOTTLE SAMPLES) AND BENTHIC MACRO-INVERTEBRATE SAMPLING LOCATIONS

largest number of taxa, comprising 45 percent; chrysophytes (37 percent) were next, followed by cyanophytes (seven percent), euglenoids (five percent), pyrrhophytes (five percent), and cryptophytes (one percent). No consistent vertical or horizontal patterns were observed, except for a summer surface concentration. The phytoplankton biomass maximum of 2,304 ug/l occurred in September, while a minimum biomass of 212 ug/l was observed in February. Phytoplankton mean densities and biomass for the sampling period are summarized in Table 2-17 and Figures 2-15 and 2-16.

2.230
Blue-green algae (Cyanophyta) were rare most of the year at the Somerset Site. The apparent high density of Coelosphaerium naegelianum in January was due to one or two large colonies in a limited number of samples. Green algae were abundant near the Somerset Site. Although several small celled species were abundant during the winter months, the greatest abundances of green algae occurred between August and November. Of the nondiatom chrysophytes, only Dinobryon sertularia was abundant, and it had a sharp July peak.

2.231
Centric diatoms had a high peak in May, dominated completely by a single species (Stephanodiscus hantzschii). Small centric diatoms, less than eight micrometers in diameter, were important during the early spring and also in the fall. The pennate diatoms, Asterionella formosa and Tabellaria flocculosa were abundant in the spring. Several periphytic diatoms were abundant in shore samples in January.

2.232
Dinoflagellates, because of their large cell size, can occur in low cell densities, but with high biomasses. Thus, comparatively few cells of Ceratium hirundinella in September comprised nearly half of the total phytoplankton biomass. Gymnodinium helveticum and several species of Peridinium contributed noticeably to the biomass in other warm months. Cryptophytes, mainly Cryptomonas spp. and Rhodomonas spp., were relatively abundant in all except the coldest months.

Euglenophytes, which are generally characteristic of eutrophic waters, were rare.

2.233
Seasonal succession of phytoplankton at the Somerset Site appears much the same as in the rest of Lake Ontario. Observed variation in the vertical dimension appeared to be related to temperature and light. During the summer, when phytoplankton was most abundant, the dominant flagellated algae concentrated at the surface.

TABLE 2-17

(Sheet 1 of 3)

DENSITIES AND BIOMASSES OF PHYTOPLANKTON GROUPS AND DENSITIES OF DOMINANT TAXA AT SOMERSET SITE FEBRUARY 1974 TO JANUARY 1975[a]

Taxa	Date	1974 2-12	3-13	4-18	5-15	6-12	7-16	8-13	9-10	10-23	11-19	12-11	1975 1-15
Cyanophyta													
Aphanocapsa elachista		0	0	0	0	3	0	3	137	11	0	0	0
Coelosphaerium naegelianum		0	0	3	9	3	0	12	257	273	293	10	200
Gomphosphaeria lacustris		25	0	0	0	0	14	2	339	19	10	0	0
Lyngbya sp.		0	0	0	0	0	0	0	0	0	0	0	23
Schizothrix calcicola		6	7	3	13	82	10	12	42	23	20	1	5
Anabaena circinalis		0	0	0	0	1	0	1	34	3	3	1	0
Aphanizomenon flos-aquae		0	0	0	1	0	1	4	25	40	21	9	6
Total		32	7	8	27	94	26	35	871	383	357	28	234
Biomass		4	2	2	14	54	5	19	244	83	95	16	28
Chlorophyta													
Sphaerocystis schroeteri		0	0	0	1	0	0	17	53	18	10	3	6
Gloeocystis planktonica		0	0	2	3	1	2	22	8	7	2	1	0
Ulothrix subconstricta		0	0	0	0	0	1	25	2	2	6	0	19
Pediastrum boryanum		9	5	1	2	0	2	6	21	30	21	8	20
Pediastrum duplex		10	0	0	1	1	2	10	11	6	3	3	0
Pediastrum simplex		2	11	0	0	1	1	15	28	126	76	21	3
Coelastrum microporum		3	32	1	6	5	8	29	57	28	23	9	0
Coelastrum reticulatum		5	0	0	0	0	0	27	7	0	0	0	0
Dictyosphaerium pulchellum		0	0	0	6	0	1	44	21	11	1	0	0
Oocystis borgei		0	0	1	0	0	1	4	13	7	5	5	2
Ankistrodesmus convolutus		20	10	19	476	69	230	159	6	12	18	11	22
Ankistrodesmus falcatus		3	2	14	89	13	5	3	0	3	5	1	4
Schroederia setigera		1	1	0	2	0	0	5	5	7	6	6	31
Scenedesmus bicellularis		20	16	36	93	82	15	39	43	40	36	23	15
Scenedesmus quadricauda		8	4	2	9	4	5	4	10	4	7	8	0
Crucigenia tetrapedia		0	5	0	2	0	0	0	0	0	0	0	0
Micractinium pusillum		4	0	0	11	3	0	1	7	1	0	0	4
Mougeotia sp.		2	0	2	3	3	3	45	508	17	191	19	4
Closterium ceratium		1	0	0	0	0	0	0	1	2	0	5	166
Total		90	96	90	749	214	300	489	894	354	440	137	332
Biomass		31	63	25	120	37	60	336	388	218	243	83	

TABLE 2-17

(Sheet 2 of 3)

Taxa	Date	1974 2-12	3-13	4-18	5-15	6-12	7-16	8-13	9-10	10-23	11-19	12-11	1975 1-15
Chrysophyta													
Dinobryon sertularia		0	0	0	3	10	367	4	1	3	1	0	0
Melosira islandica		10	0	31	50	4	2	1	0	1	0	0	1
Stephanodiscus astraea		3	6	52	37	5	5	1	3	8	6	9	45
Stephanodiscus hantzschii		40	123	183	1302	39	15	3	1	57	9	2	28
Stephanodiscus niagarae		8	2	7	4	1	1	0	0	20	13	21	42
Small centrics		68	14	35	80	7	13	11	14	20	10	21	278
Tabellaria flocculosa		35	51	47	71	7	1	0	0	4	2	0	0
Diatoma tenue var. elongatum		0	25	1	2	1	1	3	5	142	249	73	20
Fragilaria crotonensis		0	55	11	19	3	2	73	44	38	27	8	7
Fragilaria spp.		0	26	7	36	37	2	7	37	64	47	4	3
Asterionella formosa		48	17	68	43	62	5	6	2	9	14	7	20
Rhoicosphenia curvata		0	1	0	0	0	0	0	0	0	0	0	28
Navicula cryptocephala		1	0	1	2	1	1	0	0	0	0	0	17
Amphora ovalis		0	0	0	0	0	0	0	0	0	0	0	15
Nitzschia dissipata		0	4	5	3	1	1	0	0	0	0	0	28
Total		222	332	467	1693	226	420	115	114	380	388	151	555
Biomass		152	226	357	910	149	70	65	66	374	352	214	756
Euglenophyta													
Trachelomonas volvocina		0	6	0	3	1	1	1	1	0	0	0	0
Total		0	6	1	4	1	1	1	1	0	0	0	0
Biomass		0	18	1	30	2	2	6	4	1	2	0	0
Pyrrhophyta													
Total		2	3	9	34	11	8	24	40	5	6	1	2
Biomass		13	61	115	370	138	124	185	1422	57	54	17	9
Cryptophyta													
Cryptomonas erosa		14	14	14	69	69	393	146	140	45	29	12	6
Rhodomonas minuta		23	41	24	338	875	154	589	379	102	89	66	4
Total		37	55	38	407	943	548	741	519	146	118	78	10
Biomass		11	12	12	100	159	392	140	179	33	26	13	4

TABLE 2-17
(Sheet 3 of 3)

Taxa	Date	1974 2-12	3-13	4-18	5-15	6-12	7-16	8-13	9-10	10-23	11-19	12-11	1975 1-15
Microflagellates													
Total		13	10	5	58	1281	22	15	12	13	19	8	16
Biomass		1	1	0	10	142	2	1	1	1	1	1	2
Total Density		396	509	620	2972	2715	1326	1431	2451	1282	1327	402	982
Total Biomass		212	382	521	1552	674	656	752	2304	767	773	344	1131

[a]Densities are expressed as cells (50-µm lengths of filamentous taxa) per milliliter, and biomasses are expressed as µg/l. Dominant taxa are those comprising 1% or more of the mean total density on any date. All numbers are rounded to the nearest whole number (the fraction .500 is rounded to the higher number) and are means of all values calculated for each date.

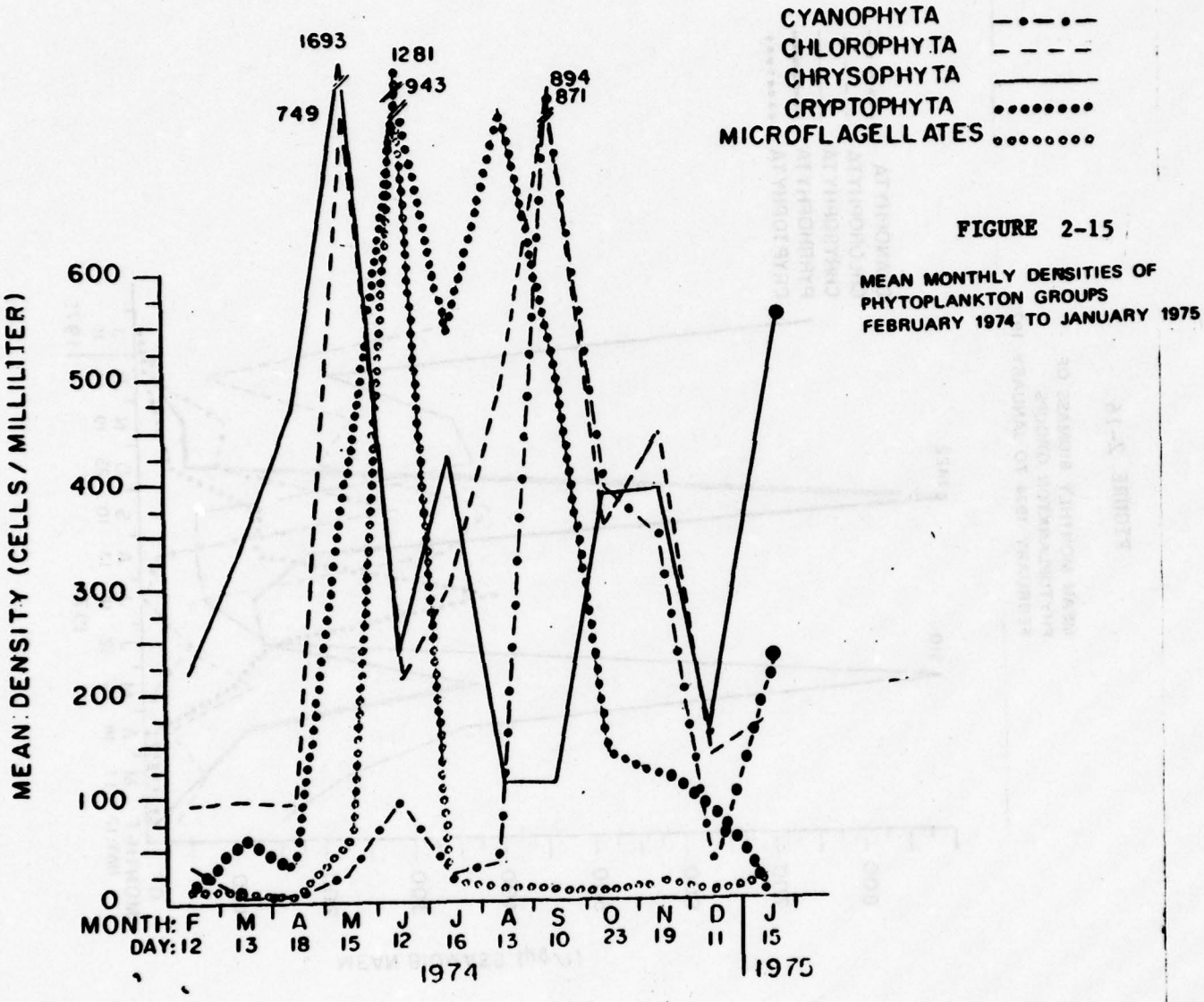
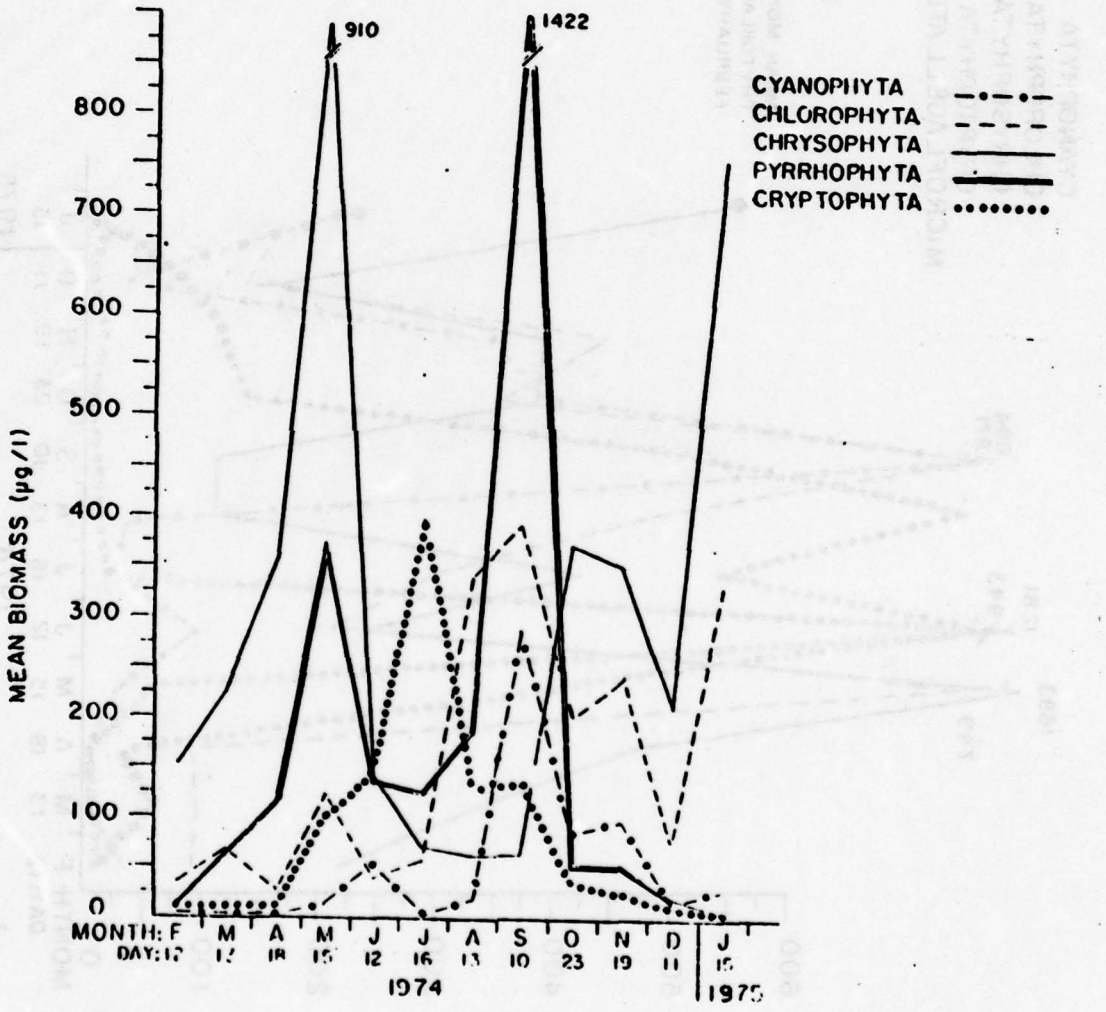


FIGURE 2-15

MEAN MONTHLY DENSITIES OF PHYTOPLANKTON GROUPS FEBRUARY 1974 TO JANUARY 1975

FIGURE 2-16

MEAN MONTHLY BIOMASS OF
PHYTOPLANKTON GROUPS
FEBRUARY 1974 TO JANUARY 1975



2.234
Since chlorphyll a is the basic catalyst of photosynthesis in all phytoplankton, the amount of this pigment is frequently used as an estimate of standing crop in a community. Phaeopigments are decomposition products of chlorophyll a. High concentrations of phaeopigment indicate algae die-offs, intense zooplankton grazing, or influx of detrital material. Chlorophyll a concentrations were highest at the surface, but showed no consistent horizontal patterns. Phaeopigment concentrations generally reflected chlorophyll a concentrations (See Figure 2-17).

2.235
Shannon and Brillouin diversity indices and separate indices for richness and evenness were calculated. The diversity indices exhibited no consistent spatial gradients.

A summer or early fall depression was evident in diversity, evenness, and richness, indicating a strong dominance in terms of both density and biomass by relatively few species. Diversity measures exhibited the same general seasonal pattern at all three depths.

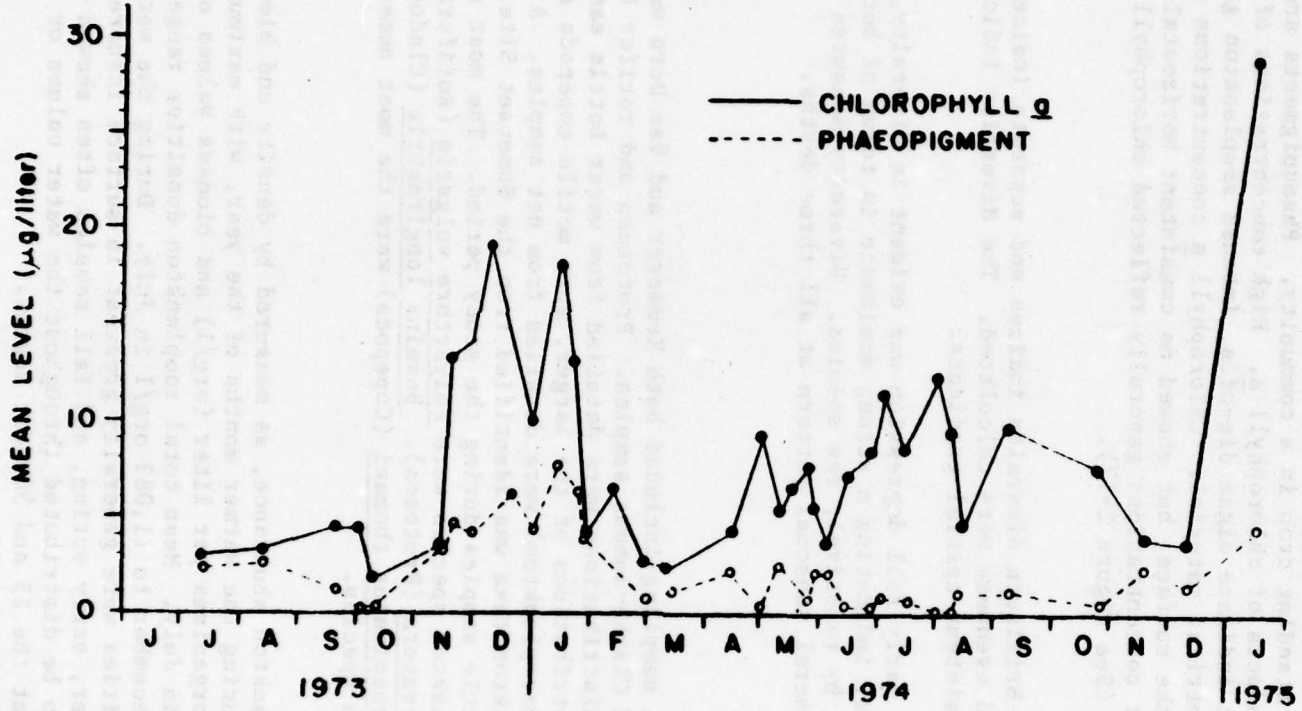
Zooplankton

2.236
Zooplankton sampling included both Kemmerer and Van Dorn water bottle samples and Clarke-Bumpus samples. Protozoan and rotifer (microzooplankton) distributions were detailed from water bottle samples, whereas distributions of the larger, more motile copepoda and cladocera (macrozooplankton) were detailed from net samples. A total of 149 zooplankton taxa was identified from the Somerset Site, including 98 from bottle samples during the study period. The most numerous microzooplankton species were Polyarthra vulgaris (Rotifera) and Codonella cratera (Protozoa). Bosmina longirostris (Cladocera) and Cyclops bicuspidatus thomasi (Copepoda) were the most numerous macrozooplankton species.

2.237
Microzooplankton abundance, as measured by density and biomass, was greatest during the warmer months of the year, with maximum density of 11,037 organisms per liter (org/l) and biomass values of 707 ug/l occurring in July. Mean total zooplankton densities ranged from 573 org/l in December to 11,083 org/l in July. During the warmer months, total densities were generally greatest in surface inshore waters, while winter, early spring, and fall samples often showed microzooplankton to be distributed throughout the water column or concentrated at the 25 and 50-foot depths.

FIGURE 2-17

MEAN SURFACE CHLOROPHYLL a AND PHAEOPIGMENT
LEVELS (ug/LITER) IN LAKE ONTARIO



2.238
Protozoans composed the majority of the total zooplankton density during all months except May, July, and August 1974, when rotifers were dominant. Protozoan densities were greatest in spring and fall and lowest in the winter. Maximum rotifer densities and biomass occurred in July, the month of maximum total zooplankton density and biomass.

2.239
A uniform vertical distribution of macrozooplankton was apparent during the late spring when water temperatures were homogenous at all depths. During the warmer months, the surface waters generally yielded the highest mean densities (17,784 vs. 10,342 org/l in July; 138,139 vs. 74,195 org/l in August; and 44,306 vs. 29,297 org/l in September). Total densities and biomasses decreased in fall and winter. During the winter, concentrations were generally highest at the offshore and deeper stations (8,516 vs. 4,645 org/l in November and 3,039 vs. 1,316 org/l in December), although temperatures were similar at all stations.

2.240
Cladocerans displayed greatest abundance and biomass in warmer months. Bosmina longirostris, the predominant cladoceran taxon, was present on each of the sampling dates. This species was generally concentrated in surface waters, displaying maximum densities in August and lowest densities in December.

2.241
Copepods were usually represented primarily by immature forms, i.e., nauplii and copepodites. Adult forms which were most abundant included Cyclops bicuspidatus thomasi and Tropocyclops prasinus mexicanus. Cyclops was generally more abundant in deeper waters while Tropocyclops was most abundant in the surface waters. Maximum densities, as well as maximum biomass values, occurred in July and were generally highest in the warmer months.

2.242
Diurnal migration studies showed little vertical movement by protozoans, but general rotifer taxa, most notably Keratella quadrata, gave indications that there was a net upward movement during daylight hours and downward movement at night. Although crustaceans were generally evenly distributed throughout the water column during the study, several taxa did exhibit vertical migrations.

2.243
Diversity values were generally lowest in the summer and highest in the fall at all depths when measured by density. No consistent

differences in diversity existed among transects. Table 2-18 is a taxonomic list of zooplankton species collected at Somerset. Table 2-19 shows the numbers of major zooplankton species per cubic meter collected from April 1974 to January 1975.

Macroflora

2.244
No vascular aquatic plants have been observed in Lake Ontario at the Somerset Site; however, the filamentous green alga Cladophora, which is not a macrophyte, forms mats near shore.

In diver surveys along transects 1, 5, 9, and 10 from the five-foot depth to the 60-foot depth, Cladophora was found in extensive beds in water up to 15 feet in depth. Cladophora growth was generally most dense in late June and July, declining in vigor until November, when no plants were found.

Benthic Macroinvertebrates

2.245
Ponar dredge grab samples taken at the Somerset Site resulted in the collection and identification of 109 taxa of benthic macroinvertebrates. Of these, 32 were oligochaete species and 27 were chironomid larvae. These two groups constituted 55 percent of the benthic taxa found. Additional major groups found at the site were non-chironomid insects (12 taxa), Crustacea (nine taxa), Gastropoda (nine taxa), and Sphaeriidae (four taxa), as well as taxa which do not fit into one of these six major categories.

Benthic densities and numbers of taxa were greatest at the 60-foot depth and lowest at the 10 and 30-foot depths. This may be due to the nature of the substrate at these depths. Certain taxa, however, were more abundant at the 10-foot or 30-foot depth, and two genera of chironomid larvae were found only at the 10-foot depth. Species diversity values differed occasionally among transects, but were not consistent in their variation. Diversity index generally increased with depth, with highest values typically at 60 feet. There was no apparent relationship between evenness values and depth. The richness value, which is heavily dependent upon the number of taxa in the sample, was normally greatest in the 60-foot samples.

2.246
The benthos at 10 feet was dominated by naidid oligochaetes, the amphipod Gammarus, and chironomid larvae. The benthic community at the 30-foot depth was dominated by oligochaetes, primarily Peloscolex spp. and Potamothrix spp. Fingernail clams Manayunkia and Gammarus

TABLE 2-18

(Sheet 1 of 2)

ZOOPLANKTON TAXA COLLECTED AT SOMERSET SITE

PROTOZOA

Acineta sp.
Acineta tuberosa
Acropisthium mutabile
Actinophrys sp.
Actinosphaerium eichhorni
Actinosphaerium sp.
Amoeba proteus
Amoeba radiosa
Amoeba sp.
Askenasia volvox
Askenasia sp.
Bresslaua sp.
Charchesium sp
Centropyxis aculeata
Centropyxis constricta
Chilodonella sp.
Chilophrys sp.
Codonella cratera
Colopidium sp.
Cothurnia sp.
Cyphoderia ampulla
Didinium nasutum
Didinium sp.
Difflugia lebes
Difflugia lobostoma
Difflugia sp.
Dileptus anser
Diamoeba horrida
Enchelys simples
Enchelys sp.
Epistylis plicatilis
Epistylis rotans
Epistylis sp.
Euglypha sp.
Frontoniella sp.
Frontonia sp.
Glaucoma sp.
Halteria sp.
Heleopera rosea
Holophrya sp.
Lionotus fasciola
Loxophyllum sp.
Paracineta crenata
Paracineta sp.
Paradileptus sp.
Paramecium sp.
Phascolodon sp.
Pluerotricha grandis
Prorodon sp.
Spathidium spathula
Spathidium sp.
Sphenoderia sp.
Staurophrya elegans
Stokesia sp.
Strobilidium gyrans
Strobilidium viride
Stylonychia sp.
Testacia sp.
Thecacineta cothurnioides
Tintinnidium fluviatile
Tintinnidium sp.
Tintinnopsis sp.
Tokophrya sp.
Trachelius ovum
Trachelius sp.
Vaginicola sp.
Vorticella campanula
Vorticella microstoma
Zoothamnium sp.

ROTIFERA

Ascomorpha sp.
Asplanchna priodonta
Asplanchna sp.
Bdelloidea
Brachionus angularis
Brachionus calcyciflorus
Brachionus quadridentata
Chromogaster ovalis
Lecane sp.
Lepadella ovalis
Monostyla lunaris
Monostyla sp.
Notholca foliacea
Notholca labis
Notholca squamula
Notholca sp.

TABLE 2-18

(Sheet 2 of 2)

ROTIFERA (Continued)

- Chromogaster sp.
- Collotheca pelagica
- Collotheca sp.
- Colurella adriatica
- Colurella obtusa
- Colurella sp.
- Conochilus unicornis
- Cupelopagis vorax
- Filinia brachiata
- Filinia longiseta
- Hexarthra mira
- Kellicottia longispina
- Keratella cochlearis
- Keratella crassa
- Keratella quadrata
- Lecane elasma
- Ploesoma hudsoni
- Ploesoma lenticulare
- Ploesoma truncatum
- Polyarthra dolichoptera
- Polyarthra euryptera
- Polyarthra major
- Polyarthra remata
- Polyarthra vulgaris
- Synchaeta oblonga
- Synchaeta pectinata
- Synchaeta stylata
- Synchaeta sp.
- Trichocerca cylindrica
- Trichocerca multicrinis
- Trichocerca similis
- Trichocerca sp.

CLADOCERA

- Alona guttata
- Alona rectangula
- Alona quadrangularis
- Bosmina longirostris
- Camptocercus rectirostris
- Ceriodaphnia sp.
- Chydorus sphaericus
- Daphnia galeata mendotae
- Daphnia longiremis
- Daphnia retrocurva
- Daphnia spp.
- Eubosmina coregoni
- Holopedium gibberum
- Leptodora kindtii
- Leydigia quadrangularis
- Polyphemus pediculus
- Scapholeberis kingi
- Sida crystallina
- Juvenile

COPEPODA

- Canthocamptus sp.
- Cyclops bicuspidatus thomasi
- Cyclops scutifer
- Cyclops vernalis
- Diaptomus ashlandi
- Diaptomus lystopus
- Diaptomus minutus
- Diaptomus oregonensis
- Diaptomus sicilis
- Diaptomus species
- Limnocalanus macrurus
- Macrocyclops albidus
- Mesocyclops edax
- Tropocyclops prasinus mexicanus
- Copepodites
- Nauplii

TABLE 2-19

NUMBERS PER M^3 OF MAJOR ZOOPLANKTON SPECIES
SOMERSET SITE, APRIL 1974 - JANUARY 1975[a]

Means of all Samples

BOTTLE SAMPLES	A	M	J	J	A	S	O	N	D	J
PROTOZOA (TOTAL)	951	625	2,104	860	3,141	6,684	804	560	434	1,239
Acropisthium mutabile	185	113	29	193	1,627	2,025	62	20	13	1
Askenasia volvox	53	9	13	54	98	133	20	41	3	
Codonella cratera	58	169	1,687	213	31	1,239	312	126	179	621
Holophyra sp.	3	26		126	158	215	31	10	1	1
Strombidium viride	47	46	54	60	589	1,279	32	47	48	7
Vorticella microstoma	485	174	76	15	82	922	156	81	39	300
ROTIFERA (TOTAL)	198	706	922	10,177	3,406	1,632	565	343	132	86
Keratella cochlearis	11	53	81	692	175	214	219	132	78	29
Polyarthra dolichoptera		26		3,180	2,155	373	57	73	20	1
Polyarthra vulgaris	61	226	208	5,727	805	764	148	65	18	11
Synchaeta sp.	3	175	340	51	90	54	72	45	5	7
TOTAL (BOTTLE SAMPLES)	1,158	1,394	3,186	11,083	6,628	8,453	1,377	915	573	1,360

CLARKE-BUMPUS NETS	A	M	J	J	A	S	O	N	D
CLADOCERA (TOTAL)	796	185		4,513	84,259	18,172		2,753	792
Bosmina longirostris	634	144		4,367	79,939	12,146		1,385	499
Eubosmina coregoni	158	28		132	21	75		895	237
COPEPODA (TOTAL)	5,249	3,474		691	14,432	2,410		2,810	1,316
Cyclops bicuspidatus thomasi	2,014	64		18	1,360	95		606	127
Tropocyclops prasinus mexicanus	71	10		10	1,253	510		132	30
Nauplii	129	703		54	178	177		17	7
Calanoid copepodites		109		46					
Cyclopoid copepodites		2,576		558					
Copepodites	2,861				11,252	1,606		1,736	1,017
TOTAL (CLARKE-BUMPUS)	7,175	6,427		14,063	106,167	36,802		6,580	2,177

[a] Only dominant groups and taxa are listed.

were also abundant in some samples. Nematodes were occasionally numerically dominant. Oligochaetes, primarily Stylodrilus heringianus, Peloscolex ferox and Potamothrix vejdovskyi clearly dominated the benthic community at the 60-foot depth.

No consistent alongshore trends in benthos could be found. Highest benthic density, 6,183/m^2, and the largest number of taxa occurred in September. The composition of the benthic community and percent composition at each sample depth are presented on Table 2-20.

Fish

2.247
Gill net, trawl, and seining samples at the Somerset Site resulted in the collection and identification of 9,102 fish representing thirty-four species. Samples were taken during the period April 1974 through July 1975 and April through October 1977. Additionally, this site was once proposed for a nuclear plant and data collected in 1972 and 1973, in this regard was also used in making decisions relative to the plants interaction with the aquatic environment. Summaries of the number of fish caught by gill nets during the data base year (1974-1975) and in 1977, are presented in Tables 2-21, 2-22, and 2-23. Seine and trawl collections from 1974 are summarized in Table 2-24. A complete description of sampling methdology is contained in the applicant's Article VIII application which is on file at the Buffalo District Office.

There is no commercial fishing in the site region, and no sport fishing has been observed there in several years of study by the applicant. No endangered or threatened fish species have been found at the Somerset Site by the applicant.

Gill Net Results

2.248
The most abundant species collected at the site by gill nets in 1974 were white perch (62 percent), alewife (10 percent), white sucker (eight percent), yellow perch (seven percent), and rainbow smelt (six percent). During the August 1974 to August 1975 expanded gill net program, a total of 980 fish was caught in the standard gill nets. White perch accounted for 60.2 percent of the total catch, followed by alewife (10.7 percent), rainbow smelt (7.6 percent), white sucker (6.1 percent), and yellow perch (6.1 percent). Coho salmon, chinook salmon, and brown trout accounted for 1.0 percent, 0.4 percent, and 1.3 percent of the catch, respectively.

2.249
The spatial distribution of fish in 1974 showed that 66 percent of the total gill net catch came from inshore nets. Fish preference for

TABLE 2-20

COMPOSITION OF THE BENTHOS COMMUNITY
AND PERCENT AT EACH SAMPLE DEPTH
(April 1974 - December 1974)

OLIGOCHAETA

	10'	30'	60'
1	14	1	6,717
5	15	404	5,245
9	41	14	7,345
10	172	767	4,628
%	1.0	4.7	94.4

CHIRONOMIDAE

	10'	30'	60'
1	31	1	241
5	169	140	208
9	38	7	224
10	7	97	158
%	18.5	18.5	62.9

NON-CHIRONOMID INSECTA

	10'	30'	60'
1	4	0	4
5	0	2	5
9	1	1	1
10	1	3	3
%	24.0	24.0	52.0

GAMMARUS

	10'	30'	60'
1	25	9	6
5	4	3	6
9	25	6	21
10	4	2	4
%	50.0	17.2	32.8

OTHERS

	10'	30'	60'
1	46	4	3,523
5	42	327	2,958
9	75	27	4,624
10	19	316	4,565
%	1.1	4.1	94.8

TOTAL BENTHOS

	10'	30'	60'
1	120	15	10,491
5	230	876	8,423
9	180	55	12,215
10	203	1,185	9,358
%	1.7	4.9	93.4

TABLE 2-21 (Page 1 of 2)

FISH CATCH BY GILL NET AT THE SOMERSET SITE, 1974

Species	April	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	% of Total
Alewife	30	21	6	9	2	1	0	1	70	9.4
Gizzard shad	0	0	0	8	1	0	1	0	10	1.3
Coho salmon	1	0	0	0	1	0	0	0	2	0.3
Chinook salmon	0	0	0	0	2	0	0	0	2	0.3
Brown trout	0	0	1	0	2	0	0	0	3	0.4
Rainbow smelt	11	8	2	2	0	20	4	0	47	6.3
Goldfish	0	0	1	1	0	0	0	0	2	0.3
Lake chub	1	0	0	0	0	1	1	1	4	0.5
Carp	0	0	1	1	6	0	0	0	8	1.1
Carp-goldfish hybrid	0	0	5	1	0	1	0	0	7	0.9
White sucker	0	12	19	15	5	4	2	3	60	8.0
Golden redhorse	0	0	0	0	0	1	0	0	1	0.1
White perch	0	12	75	169	204	3	0	0	463	62.0
White bass	1	0	0	0	1	0	0	0	2	0.3
Rock bass	0	1	1	3	8	1	0	0	14	1.9
Yellow perch	0	7	0	24	12	9	0	0	52	7.0
Total fish collected	44	61	111	233	244	41	8	5	747	100.0
Fish per net	6.3	12.2	12.3	12.9	14.4	2.3	0.4	0.8	7.6	
Fish per bottom net	6.3	12.2	12.3	23.6	23.9	3.4	0.3	2.5	12.4	
Time of set (days)	1	1	1	1	1	1	1	1	1	

TABLE 2-21 (Page 2 of 2)

FISH CATCH BY GILL NET SET FOR 24 HOURS AT THE SOMERSET SITE, 1975

	Standard Gill Net (125 ft)							½ Inch Mesh Panel (25 ft)						
	April	May	June	July	August	Total	% of Total	April	May	June	July	August	Total	% of Total
Alewife	23	39	15	9	6	92	20.5	193	863	564	512	22	2,154	60.3
Gizzard Shad	0	0	0	3	2	5	1.1	0	0	0	0	0	0	0.0
Chinook Salmon	0	0	0	1	1	2	0.4	0	0	0	0	0	0	0.0
Coho Salmon	1	5	3	0	0	9	2.0	0	0	0	0	0	0	0.0
Brown Trout	2	0	6	0	3	11	2.4	0	0	0	0	0	0	0.0
Lake Trout	0	0	0	0	0	0	0.0	0	0	1			1	0.0
Rainbow Smelt	18	24	4	1	1	48	10.7	618	65	26	5	5	719	20.0
Lake Chub	1	2	0	0	0	3	0.7	4	5	2	1	2	14	0.4
Carp	0	0	0	2	1	3	0.7	0	0	0	0	0	0	0.0
Spottail Shiner	0	0	0	0	1	1	0.2	80	148	414	21	31	694	19.4
White Sucker	5	8	3	12	3	31	6.9	0	0	0	0	0	0	0.0
Brown Bullhead	0	0	0	1	0	1	0.2	0	0	0	0	0	0	0.0
White Perch	3	24	48	104	35	214	47.7	1	0	0	0	1	2	0.0
White Bass	3	1	0	0	0	4	0.9	0	0	0	0	0	0	0.0
Smallmouth Bass	0	0	0	0	1	1	0.2	0	0	0	0	1	1	0.0
Rock Bass	0	0	3	5	0	8	1.8	0	0	0	0	0	0	0.0
Yellow Perch	0	2	1	7	5	15	3.3	0	0	0	0	0	0	0.0
Freshwater Drum	0	0	0	0	1	1	0.2	0	0	0	0	0	0	0.0
Sculpin	0	0	0	0	0	0	0.0	3	0	1	0	0	4	0.1
Total Fish	56	105	83	145	60	449		899	1,081	1,008	539	62	3,589	
Nets Set	17	18	18	18	17	88		5	5	5	6	5	26	
Fish Per Net	3.3	5.8	4.6	8.1	3.5	5.1		179.8	216.2	201.6	89.8	12.4	138.0	
Fish at Bottom	34	90	76	144	52	396		629	986	922	431	48	3,016	
Fish per Bottom Net	3.8	10.0	8.4	16.0	5.8	8.8		209.7	328.7	307.3	143.7	16.0	201.1	

TABLE 2-21 (Page 2 of 2)

FISH CATCH BY GILL NET SET FOR 24 HOURS AT THE SOMERSET SITE, 1975

	Standard Gill Net (125 ft)							½ Inch Mesh Panel (25 ft)						
	April	May	June	July	August	Total	% of Total	April	May	June	July	August	Total	% of Total
Alewife	23	39	15	9	6	92	20.5	193	863	564	512	22	2,154	60.3
Gizzard Shad	0	0	0	3	2	5	1.1	0	0	0	0	0	0	0.0
Chinook Salmon	0	0	0	1	1	2	0.4	0	0	0	0	0	0	0.0
Coho Salmon	1	5	3	0	0	9	2.0	0	0	0	0	0	0	0.0
Brown Trout	2	0	6	0	3	11	2.4	0	0	0	0	0	0	0.0
Lake Trout	0	0	0	0	0	0	0.0	0	0	1			1	0.0
Rainbow Smelt	18	24	4	1	1	48	10.7	618	65	26	5	5	719	20.0
Lake Chub	1	2	0	0	0	3	0.7	4	5	2	1	2	14	0.4
Carp	0	0	0	2	1	3	0.7	0	0	0	0	0	0	0.0
Spottail Shiner	0	0	0	0	1	1	0.2	80	148	414	21	31	694	19.4
White Sucker	5	8	3	12	3	31	6.9	0	0	0	0	0	0	0.0
Brown Bullhead	0	0	0	1	0	1	0.2	0	0	0	0	0	0	0.0
White Perch	3	24	48	104	35	214	47.7	1	0	0	0	1	2	0.0
White Bass	3	1	0	0	0	4	0.9	0	0	0	0	0	0	0.0
Smallmouth Bass	0	0	0	0	1	1	0.2	0	0	0	0	1	1	0.0
Rock Bass	0	0	3	5	0	8	1.8	0	0	0	0	0	0	0.0
Yellow Perch	0	2	1	7	5	15	3.3	0	0	0	0	0	0	0.0
Freshwater Drum	0	0	0	0	1	1	0.2	0	0	0	0	0	0	0.0
Sculpin	0	0	0	0	0	0	0.0	3	0	1	0	0	4	0.1
Total Fish	56	105	83	145	60	449		899	1,081	1,008	539	62	3,589	
Nets Set	17	18	18	18	17	88		5	5	5	6	5	26	
Fish Per Net	3.3	5.8	4.6	8.1	3.5	5.1		179.8	216.2	201.6	89.8	12.4	138.0	
Fish at Bottom	34	90	76	144	52	396		629	986	922	431	48	3,016	
Fish per Bottom Net	3.8	10.0	8.4	16.0	5.8	8.8		209.7	328.7	307.3	143.7	16.0	201.1	

TABLE 2-22

FISH CATCH BY 1/2-INCH MESH PANEL GILLNET AT SOMERSET SITE, 1977, TRANSECT 5

Species	Date May 2	May 28	Jun 26	Jul 27	Aug 21	Sep 22	Oct 11	Total	Percent of Total
Alewife	1	4	12	8		8		33	3.4
Spottail Shiner	33	107	121	49	9	84	60	463	47.1
Yellow Perch							2	2	0.2
Mottled Sculpin			1					1	0.1
Rainbow Smelt	286	41	3	1	10	15	93	449	45.7
Lake Chub	4	6	1	11	2	2	9	35	3.6
Total Fish	324	158	138	69	21	109	164	983	100
Nets Set	6	6	6	6	6	6	6	42	
Fish Per Net	54.0	26.3	23.0	11.5	3.5	18.2	27.3	23.4	
Fish at Bottom	307	135	129	57	20	92	97	837	85.1
Bottom Nets Set	3	3	3	3	3	3	3	21	
Fish Per Botton Net	102.3	45.0	43.0	19.0	6.7	30.7	32.3	39.9	

TABLE 2-22 (Cont'd)

FISH CATCH BY STANDARD FIVE PANEL GILLNET AT SOMERSET SITE, 1977, TRANSECT 5

Species	Date							Total	Percent of Total
	May 2	May 28	Jun 26	Jul 27	Aug 21	Sep 22	Oct 11		
Alewife		3		4		3		10	7.2
Gizzard Shad							1	1	0.7
Chinook Salmon	7	5				1	1	14	10.1
Coho Salmon		1						1	0.7
Brown Trout	1	5	7		1	6		20	14.5
Lake Trout	1	7						8	5.8
Carp			2	1				3	2.2
White Sucker	1	5	2	4	1	1	3	17	12.3
White Perch		3	14	12			1	30	21.7
Rock Bass				1		1		2	1.4
Yellow Perch				1	1	1	1	4	2.9
Freshwater Drum		2		1				3	2.2
Rainbow Smelt	2	2	1		1		7	13	9.4
Rainbow Trout				1				1	0.7
Splake Trout				5		2	4	11	8.0
Total Fish	12	33	26	30	4	15	18	138	100
Nets Set	6	6	6	6	6	6	6	42	
Fish Per Net	2.0	5.5	4.3	3.0	0.7	2.5	3.0	3.3	
Fish at Bottom	10	25	22	26	1	10	13	107	77.5
Bottom Nets Set	3	3	3	3	3	3	3	21	
Fish Per Botton Net	3.3	8.3	7.3	8.7	0.3	3.3	4.3	5.1	

Table 2-23

Fish Catch Summary at Somerset Site from Gillnets
(Transect 5, 1975 and 1977)

Species	1975 # Caught	1975 % of Total	1975 Rank	1977 # Caught	1977 % of Total	1977 Rank
Alewife	2,251	56.9	1	43	3.84	3
Rainbow Smelt	801	20.25	2	462	41.21	2
Spottail Shiner	709	17.92	3	463	41.30	1
White Perch	130	3.29	4	30	2.68	5
Lake Chub	18	0.46	5	35	3.12	4
White Sucker	12	0.30	6	17	1.52	7
Yellow Perch	10	0.25	7	6	0.54	11
Coho Salmon	5	0.13	8	1	0.09	16.5
Brown Trout	4	0.10	10	20	1.78	6
Rock Bass	4	0.10	10	2	0.18	14
Sculpin	4	0.10	10	1	0.09	16.5
Gizzard Shad	2	0.05	12	1	0.09	16.5
Carp	1	0.025	15.5	3	0.27	12.5
Brown Bullhead	1	0.025	15.5	0	-	-
Chinook Salmon	1	0.025	15.5	14	1.25	8
Freshwater Drum	1	0.025	15.5	3	0.27	12.5
Lake Trout	1	0.025	15.5	8	0.71	10
Smallmouth Bass	1	0.025	15.5	0	-	-
Rainbow Trout	0	-	-	1	0.09	16.5
Splake Trout	0	-	-	11	0.98	9
Total	3,956			1,121		

TABLE 2-24

SPECIES, NUMBER, AND RELATIVE DENSITY OF FISHES SEINED AND TRAWLED AT THE SOMERSET SITE IN 1974(a)

	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL
Alewife	56 (302)	106 (76)	337 (27)	262 (0)	200 (1)	1 (0)	962 (406)
Rainbow smelt	141 (18)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	142 (18)
Emerald shiner	250 (1)	5 (0)	16 (0)	3 (0)	1 (0)	37 (0)	312 (1)
Common shiner	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	1 (0)
Spottail shiner	4 (9)	2 (1)	6 (18)	219 (0)	16 (0)	8 (0)	255 (28)
Longnose dace	10 (0)	0 (0)	4 (0)	15 (0)	0 (0)	1 (0)	30 (0)
White sucker	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	1 (0)
Threespine stickleback	22 (3)	1 (30)	0 (0)	0 (0)	0 (0)	0 (0)	23 (33)
Rock bass	0 (0)	0 (0)	0 (1)	0 (0)	0 (0)	0 (0)	0 (1)
Tessellated darter	1 (30)	11 (1)	0 (0)	0 (0)	0 (0)	0 (0)	12 (31)
Sculpin	0 (7)	0 (0)	0 (0)	0 (0)	0 (1)	0 (0)	0 (8)
TOTAL FISH	484 (370)	126 (108)	364 (46)	500 (0)	217 (2)	47 (0)	1738 (526)
Fish per seine haul	44	25.2	72.8	62.5	108.5	9.4	48.3
Water volume (cu. m.)	284.8(2122.4)	178.0(2122.4)	439.9(4296.6)	703.8	176.0(5585.6)	110.0	1892.5(14127)
Fish collected per 100 cu. m.	169.9(17.4)	70.8(5.1)	82.7(1.1)	71.0(0)	123.3(0.04)	42.7(0)	91.8(3.7)

(a) Numbers in parentheses represent trawl catches.

the bottom is indicated when bottom sets are compared with combined surface and middepth sets for August through December. A total of 78 gill nets was fished during this period, half on the bottom and the remainder at middepth and surface. A total of 531 fish was caught, of which 466 or 88 percent were taken in bottom nets.

2.250
The number of white perch collected in 1974, increased steadily from April thrugh September. During May, white perch occurred alongshore and on the bottom to the 25-foot depth. During June and July of 1974 and 1975, white perch were found almost entirely at the inshore stations. Somewhat lower concentrations of white perch occurred at offshore bottom stations during May, August, and September.

2.251
The alewife occurred primarily at the surface in April, and at the inshore (10-foot depth) and 30-foot bottom stations during May, June, and July in the spawning season. Alewife populations declined rapidly after July following spawning, and through the fall. August catches during 1974 and 1975 were small and mostly from offshore sets, demonstrating that alewife move into the open-lake during the winter.

2.252
The early spawing rainbow smelt reached peak levels in April 1975, and were found predominatnly at the bottom (81 percent). A small percentage of the smelt population remained at the Somerset Site on 21 May after the spawning peak; these were widely distributed over the stations and depths, but occurred predominatnly on the bottom (83 percent). During June through March, most smelt occupied the open-lake.

2.253
Brown trout were collected primarily inshore except during the two warmest months (July and August). Coho and chinook salmon were widely distributed over the stations and depths, except during July and August when inshore waters are too warm.

2.254
Spatial variation of the major elements of the fish community can be summarized as follows: when the few dominant species (alewife, smelt, white perch) reach high population densities, they concentrated near the shore (10-foot depth).

2.254a.
Throughout the program, white perch predominated the catch in the standard (five panel) gillnet. However, the addition of the 1/2-inch mesh panel data in the years 1975 and 1977 reduces the white

perch dominance in favor of the forage species alewife, rainbow smelt, and spottail shiner. Table 2-23 presents a summary of data from 1975 and 1977, the two years for which 1/2-inch mesh panel data were collected. This summary presents only data from Transect 5, the transect on which the 1/2-inch mesh was deployed. As shown on the table, the same five species (alewife, rainbow smelt, spottail shiner, white perch, and lake chub) are predominant in both years. These five fish species make up over 92 percent of the catch in both years. The change noted in the raw number of fish caught is due largely to a much reduced catch of alewife, and to lesser degree, to decreases in the catch of rainbow smelt, spottail shiner, and white perch in 1977. This may be the result of the severe weather conditions of the winter of 1976-1977.

The 1977 data also suggest an increase in the percent contribution of salmonids to the total fish catch. Since the total number of salmonids caught in both years is quite low, this trend may or may not be real. If real, it may indicate the success of the NYSDEC salmonid stocking program.

Seining Results

2.255
Seventeen species and a total of 2,670 fish were collected by seining from May to October 1974, and April through October 1977. In July 1974, alewife dominated the catch at 55 percent of the total, with emerald shiner (18 percent), spottail shiner (15 percent), and rainbow smelt (eight percent) next in order of abundance. These four species made up over 96 percent of the total seine catch. In 1977, spottail shiner comprised 48 percent of the total catch, with emerald shiner (42 percent), rainbow smelt (three percent), longnose dace (three percent), and alewife (two percent) next in order of abundance.

2.256
In 1974, rainbow smelt were common during May, probably in association with spawning runs. Emerald shiner and spottail shiner were captured on most sampling dates. Early in the season, large alewife moved inshore for spawning. By mid-July, young-of-the-year alewife began to show up in the catch as adult members declined. By the fall, both adults and young of most species moved offshore.

Trawl Results

2.257
In 1974, trawls captured a total of 526 fish. Alewife (77 percent) were the most abundant fish. The remainder of the catch was

comprised of threespine stickleback (six percent), tessellated darter (six percent), spottail shiner (five percent), rainbow smelt (three percent), sculpin (two percent), emerald shiner (0.2 percent), and rock bass (0.2 percent).

Fish Dieoffs

2.258
Sizes of the alewife and rainbow smelt populations are strongly influenced by dieoffs. Periodic midwinter, spring, and summer dieoffs of alewife have been common since their first appearance in Lake Ontario around 1875. The mass mortalities of the alewife, a species of marine origin, may be related to its inability to adjust to the cold water, temperature fluctuations, limited food supply, osmoregulation problems, and/or iodine deficiency (Colby, 1973).

Fish Food

2.259
Larval fish feed primarily on crustacean zooplankton, whereas adult and subadult fish feed on zooplankton, benthos, or other fish. Through stomach analyses, the applicant has established the primary foods of some adult fish at the Somerset Site as listed below.

MAJOR FOOD ITEMS FOUND IN FISH GUT ANALYSIS

Species	Food
White sucker	Amphipods, midge larvae, fingernail clams, snails
White perch	Crayfish, amphipods, fish eggs (alewife), midge larvae, small fish
Rock bass	Mainly crayfish
Yellow perch	Mainly crayfish
Rainbow smelt	Small fish, midge larvae, and probably zooplankton
Coho and Chinook salmon	Probably alewife

Ichthyoplankton

2.260
Ichthyoplankton surveys were conducted from April through December 1974 to determine the seasonal occurrence, distribution, and relative

abundance of fish eggs and young in Lake Ontario near the Somerset Site. Ichthyoplankton was sampled using one-half meter nets. Alewife and rainbow smelt eggs and larvae dominated the ichthyoplankton. No eggs or larvae were taken in April, October, November, or December collections. Approximately 107 eggs and 2,265 larvae representing nine taxa were collected during the data base year. Table 2-25 shows the number of eggs and larvae collected from 2 May 1974 to 6 September 1975.

Alewife were the most abundant larvae in plankton net collections from June through September. They comprised 87.8 percent of the total catch in perpendicular to shore tows, and 93 percent in parallel to shore tows. Relative abundance of fish eggs and larvae taken in ichthyoplankton collections in 1974 is presented in Table 2-26A. Table 2-26 compares ichthyoplankton data from 1974 and 1977 at the 30 and 50-foot contour.

2.261
Alewife were most abundant in July and early August. No alewife eggs were identified in 1974 plankton net collections. Most of the unidentified eggs may have been alewife, as egg sizes (0.94 to 1.25 millimeters) were similar to those of the alewife, and their presence coincided with the presence of large number of pelagic alewife yolk larvae in the water column. Alewife apparently spawn at the Somerset Site in the nearshore zone from late May through August. Temperatures at that time were between 64.6 and 68.4°F. Alewife larvae were generally most abundant near the surface at Somerset Alternate Site in June and July, especially at the inner stations. Later, they became more dispersed and were relatively abundant at the 25-foot depth in water 25 to 65 feet deep. Less than 30 percent of the catch came from samples taken at 25 and 50 feet. Tows made parallel to shore in early August revealed that alewife larvae were most abundant at the 10-foot depth contour.

2.262
Few alewife late larvae or juveniles were taken in plankton net collections, but 165 specimens were collected in a seine haul at transect 5 on 17 July. In August, a total of 262 juvenile alewife was taken in seine collections at the site. The near absence of larger specimens in plankton net collections appears to be the result of concentrations of the young along the shore, although avoidance of the plankton nets could be a factor.

2.263
Rainbow smelt usually spawn in streams. Some lakeshore spawning of smelt is probable at the Somerset Site, due to the lack of suitable stream habitat. Rainbow smelt eggs were first collected

Table 2-25

NUMBER OF FISH EGGS COLLECTED IN 0.5-METER NET AND PUMP SAMPLES AT SOMERSET SITE IN 1974

Species	May 2 No.	May 29 No.	June 13 No.	July 9-10 No.	August 7 No.	August 20 No.	September 6 No.
Osmerus mordax eggs	3	0	0	0	0	0	0
Cyprinidae eggs	0	0	10	1	0	0	0
Unidentified eggs:							
Viable	0	0	1	30	15	2	0
Cases	0	0	0	0	42	0	0
Dead	0	0	0	0	3	0	0
Total eggs	3	0	11	31	60	2	0
Alosa pseudoharengus:							
Yolk-sac larvae	0	0	5	412	1005	15	0
Early larvae	0	0	1	345	131	23	8
Late larvae	0	0	0	0	3	20	3
Osmerus mordax:							
Yolk-sac larvae	0	59	24	0	0	0	0
Early larvae	0	2	11	0	0	0	0
Cyprinus carpio	0	0	0	0	6	0	0
Notropis atherinoides	0	0	0	0	0	1	0
Morone americana	0	0	2	1	0	0	0
Morone spp.	0	0	0	1	0	0	0
Lepomis sp.	0	0	0	0	0	1	0
Unidentified percid	0	0	0	1	0	0	0
Perca flavescens:							
Yolk-sac larvae	0	0	2	0	0	0	0
Early larvae	0	0	6	0	0	0	0
Unidentifiable	0	0	0	53	61	63	0
Total larvae	0	61	52	812	1206	123	11

TABLE 2-26 A

RELATIVE ABUNDANCE OF FISH EGGS AND LARVAE TAKEN IN ICHTHYOPLANKTON COLLECTIONS AT SOMERSET SITE IN 1974(*)

Species	May	June	July	August	Sept.	Percent of Annual Catch
			Composition of Eggs (%)			
Osmerus mordax	100.0	0	0	0	0	5.3
Cyprinidae	0	47.6	4.8	0	0	19.3
Unidentified	0	52.4	95.2	58.3	0	66.7
Unidentified egg case	0	0	0	41.7	0	8.7
Percent of annual catch	5.3	36.8	36.8	21.1	0	100.0
			Composition of Young (%)			
Alosa pseudoharengus	0	12.3	91.2	92.0	100.0	87.8
Osmerus mordax	100.0	70.8	0	0	0	3.8
Cyprinus carpio	0	0	0	0.3	0	0.2
Notropis atherinoides	0	0	0	0.2	0	0.1
Morone americana	0	4.9	0.2	0	0	0.2
Morone sp.	0	0	0.2	0	0	0.1
Lepomis sp.	0	0	0	0.2	0	0.1
Perca flavescens	0	9.6	0	0	0	0.2
Unidentified percid	0	2.4	0	0	0	0.1
Unidentifiable	0	0	8.4	7.3	0	7.4
Percent of annual catch	2.8	4.5	33.7	58.5	0.5	100.0

* No eggs or larvae in April, October, November, and December collections. Includes only collections taken perpendicular to shore.

NUMBER, DENSITY, AND PERCENT DISTRIBUTION BY AREA OF FISH EGGS IN ICHTHYOPLANKTON COLLECTIONS AT SOMERSET SITE, MAY 2, 1974(a)

Total volume of water sampled (cu m)	755.24
Number of eggs(b)	3
Density (number per cubic meter)	0.004
Percent of catch	100

a. Osmerus mordax eggs comprised 100% of the catch. Sampling at Stations 51 (surface), 52 (surface and 25 ft), and 53 (surface, 25 ft, and 50 ft). Two replicate samples taken at each station.
b. Caught in one sample taken at 25-ft depth at Station 53.

TABLE 2-26

SOMERSET ICHTHYOPLANKTON DATA
1974 and 1977
30-FOOT WATER COLUMN vs 50-FOOT WATER COLUMN
(Two-Mile Area)

Species	1974 30-Foot	1974 50-Foot	1977 30-Foot	1977 50-Foot
Alewife	6.89	6.87	6.54	3.96
Rainbow Smelt	5.79	11.66	12.48	6.69
Yellow Perch	17.51	1.75	0	0
Morone (White Perch)	21.01	0	13.51	0
Carp			20.43	0
Clupeidae			2.32	0.82
Notropis			0	21.01
Threespne Stickleback			21.01	0
Unidentified			3.95	16.54

in early May at a temperature of 45.9°F at the Somerset Site. Smelt larvae (3.8 percent of the total larvae catch) dominated May and June collections, but were absent from later collections. The spatial distribution of larvae was variable. No consistent distributional patterns were apparent for smelt larvae.

2.264
Other species collected include carp, emerald shiner, white perch, yellow perch, and sunfish species. These species comprised less than 1.5 percent of the total ichthyoplankton. Spawning times, temperatures, and locations for common fish species in Lake Ontario are presented in Table 2-27.

Ichthyoplankton Stream Sampling

2.265
An ichthyoplankton sampling program was conducted monthly along the unnamed creek and in its two ponds at the Somerset Site from April through December 1975. Sampling locations are shown in Figure 2-18. The following conclusions can be drawn from these collections.

- The unnamed creek studied is a relatively small intermittent stream that is dry most of the year, except for two isolated ponds.

- Larvae and juveniles of the fathead minnow, brown bullhead, sunfish spp., largemouth bass, and a few adult cyprinids were taken in ichthyoplankton collections made during the study.

- Although no eggs or newly hatched larvae were collected, successful spawning apparently does occur. The presence of young fish (larvae and juveniles) in the collection supports this conclusion.

- All species taken in collection were common, and spawn successfully throughout Lake Ontario and its tributaries.

- An earthen dike constructed near the mouth of the unnamed creek eliminates the possibility of valuable fish such as salmon and smelt migrating upstream from Lake Ontario to spawn. No eggs and larvae of these species were collected during this stream survey.

TABLE 2-27

SPAWNING TIME, TEMPERATURE AND
LOCATION OF COMMON FISH SPECIES
IN LAKE ONTARIO

Species	Spawning Time & Temperature	Location
Alewife	June-August, 56-84°F	inshore
Rainbow Smelt	March-June, 34-75°F	mouths of streams, alongshore
White Perch	Mid-May-End of June, 51.8-59°F	shallow water, 0-12 ft
Yellow Perch	Late May-Early June, 45-50°F	shallow water over vegetation and on gravel bars
Brown Trout	Mid Oct.-Early Nov., 44-48°F	shallow, gravelly headwaters
Coho Salmon	Oct.-Nov. or Nov.-Jan. (stocked)	shallow, gravelly areas of river tributaries
White Sucker	Early May-Early June, 50°F	gravelly streams
Spottail Shiner	June-July	sandy shoals

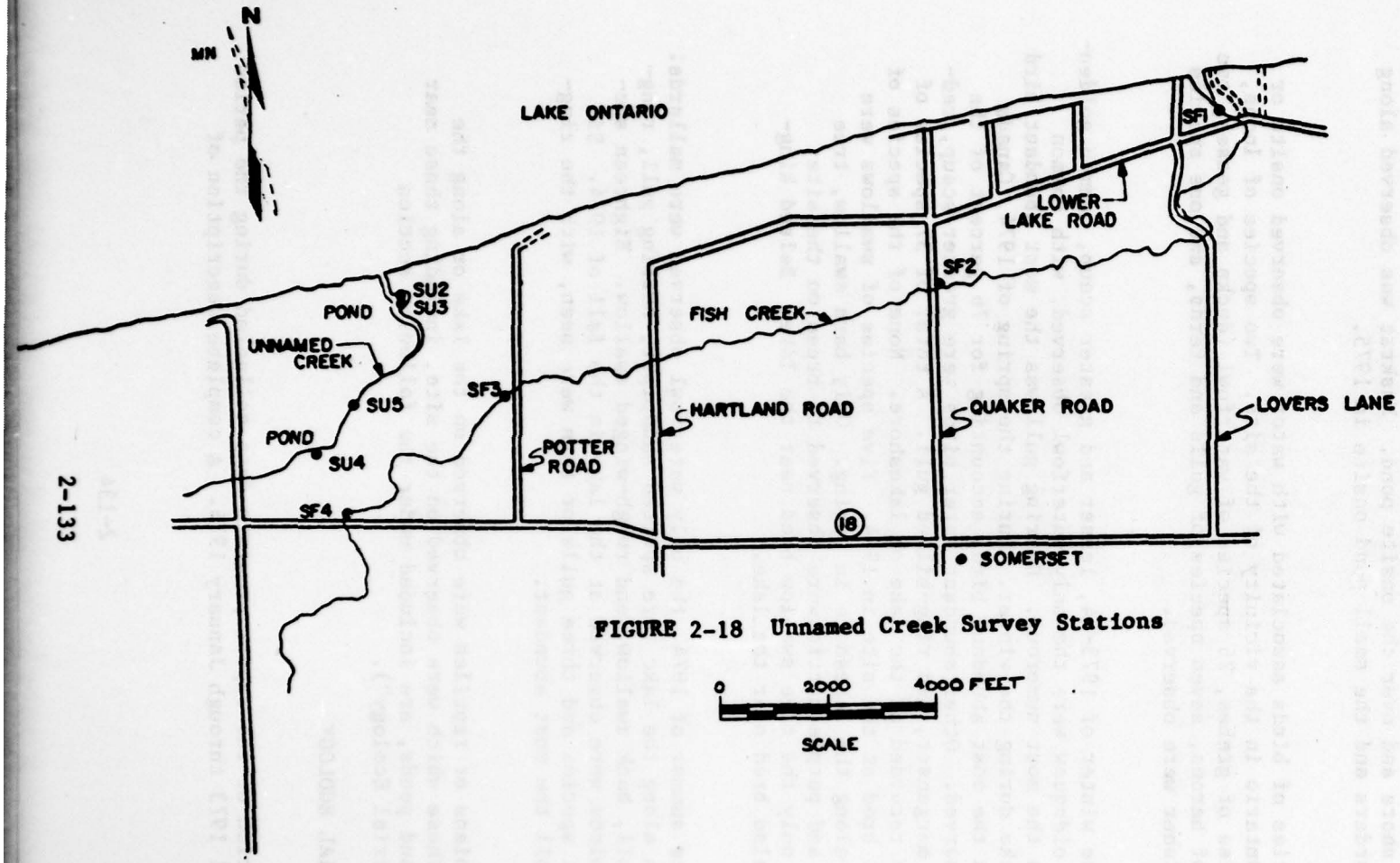


FIGURE 2-18 Unnamed Creek Survey Stations

Other Vertebrate Wildlife

2.266
No mammal associated with the aquatic habitat was observed on the lake or along the lake shore. Unidentified bats were observed along the lake shore and over the onsite pond. Muskrat was observed along stream borders and the small pond onsite in 1975.

2.267
Many species of birds associated with water were observed onsite or on Lake Ontario in the vicinity of the site. Two species of loons, two species of grebes, 26 species of waterfowl (ducks and geese), two species of herons, seven species of gulls and terns, and one species of kingfisher were observed.

2.268
During the winter of 1973-74, lesser and greater scaup, common goldeneye, and oldsquaw were the only waterfowl observed, with common goldeneye the most numerous. Herring gull was the most abundant bird at the lake during the winter. During the spring of 1974, Canada goose was the most abundant bird, accounting for 76 percent of the total observed. Other abundant water birds were greater scaup, red-breasted merganser, and ring-billed gull. A total of 37 species of birds was recorded at the lake or lakeshore. None of the species of waterfowl bred at the site in 1974. Five species of swallows were observed along the lakeshore in spring. Only barn swallow, tree swallow, and purple martin were observed to breed on the site; however, only the tree swallow bred near the lake. Belted kingfishers also bred near the lake.

2.269
During the summer of 1974, the only waterfowl observed were mallards. Also seen along the lake were spotted sandpiper, herring gull, ring-billed gull, bank swallow, and rough-winged swallow. Eighteen species of birds were observed at the lake in the fall of 1974. Six waterfowl species and three gulls or tern were seen, with the ring-billed gull the most abundant.

2.270
No amphibians or reptiles were observed on the lake or along the shore. Those which were observed on the site, including those near streams and ponds, are included under the following section ("Terrestrial Ecology").

TERRESTRIAL ECOLOGY

2.271
This section of the report presents data collected during the period from fall 1973 through January 1976. A complete description of

sampling methodology and results as well as an overview of the ecology of western New York are found in part 79 of the applicant's Article VIII application.

General Description

2.272
The topography of the Somerset Site is relatively flat with no unusual features. The cover type is mostly active agriculture and open field. Elevation of the site ranges from about 245 feet (lake level) to about 300 feet above sea level. Little of the area is subject to flooding, partly because the lake is bordered by high banks rising 10 to 20 feet above water level.

Most of the Somerset Site has been disturbed to varying degrees as a result of agriculture and/or timber harvest. The disruption of the natural vegetation has resulted in a mosaic of vegetative cover types in various stages of secondary plant succession.

Vegetation Cover Types

2.273
The vegetative cover types of the natural and inactive agricultural land within the one-mile radius and within the site boundary represent a number of plant communities. These range from those of open fields in various stages of secondary succession to those of mature hardwood forest. The vegetative cover types were classified as open field, deserted orchard, deciduous forest, and coniferous forest. The area occupied by these cover types varied during the study due to the change in the agricultural use of land. Table 2-28 indicates the area for each general cover type within one mile of the facility and within the site boundary.

The vegetative cover types of the Somerset Site and the study area are presented in Figure 2-19 and Table 2-29. Figure 2-20 shows the numbered study areas discussed in the following paragraphs on vegetative cover types.

Open Fields

2.274
Open fields comprised 42 percent of the site during the first six months of study and 45 percent during the remainder. Most of the fields sampled were only recently abandoned. Area 3 (111 acres) is composed of several open fields that have been abandoned for various periods up to seven years. The dominant shrub species were red-osier dogwood, slippery elm, and grape. The predominant ground stratum

TABLE 2-28

LAND USE AND GENERAL COVER TYPES WITHIN A ONE MILE RADIUS OF THE SOMERSET SITE FACILITY AND WITHIN THE SITE BOUNDARY, AUGUST 1975

Land Use[a]	1-Mi Radius		Site Boundary	
	Area (Acres)	Percent of Total Area	Area (Acres)	Percent of Total Area
Residential	34	3	30	3
Commercial and industrial	1	<1	1	<1
Active agricultural land:				
Annual cropland	544	47	472	49
Orchard, vineyard, and blueberry	123	11	0	0
Hay and pasture	68	6	67	7
Evergreen plantation	9	1	0	0
Active Agricultural Land Total:	744	65	539	56
Natural vegetation and inactive agricultural land:				
Open field	194	17	245	25
Deserted orchard	36	3	32	3
Fence row	7	1	8	1
Woodland	84	7	60	6
Lakeshore	7	1	5	1
Stream border:				
Woodland	27	2	35	4
Shrub	7	1	7	1
Natural Vegetation and Inactive Agricultural Land Total:	362	32	392	41
Ponds	1	<1	1	<1
TOTAL LAND USE	1142	100	963	100

a. Excludes Lake Ontario.

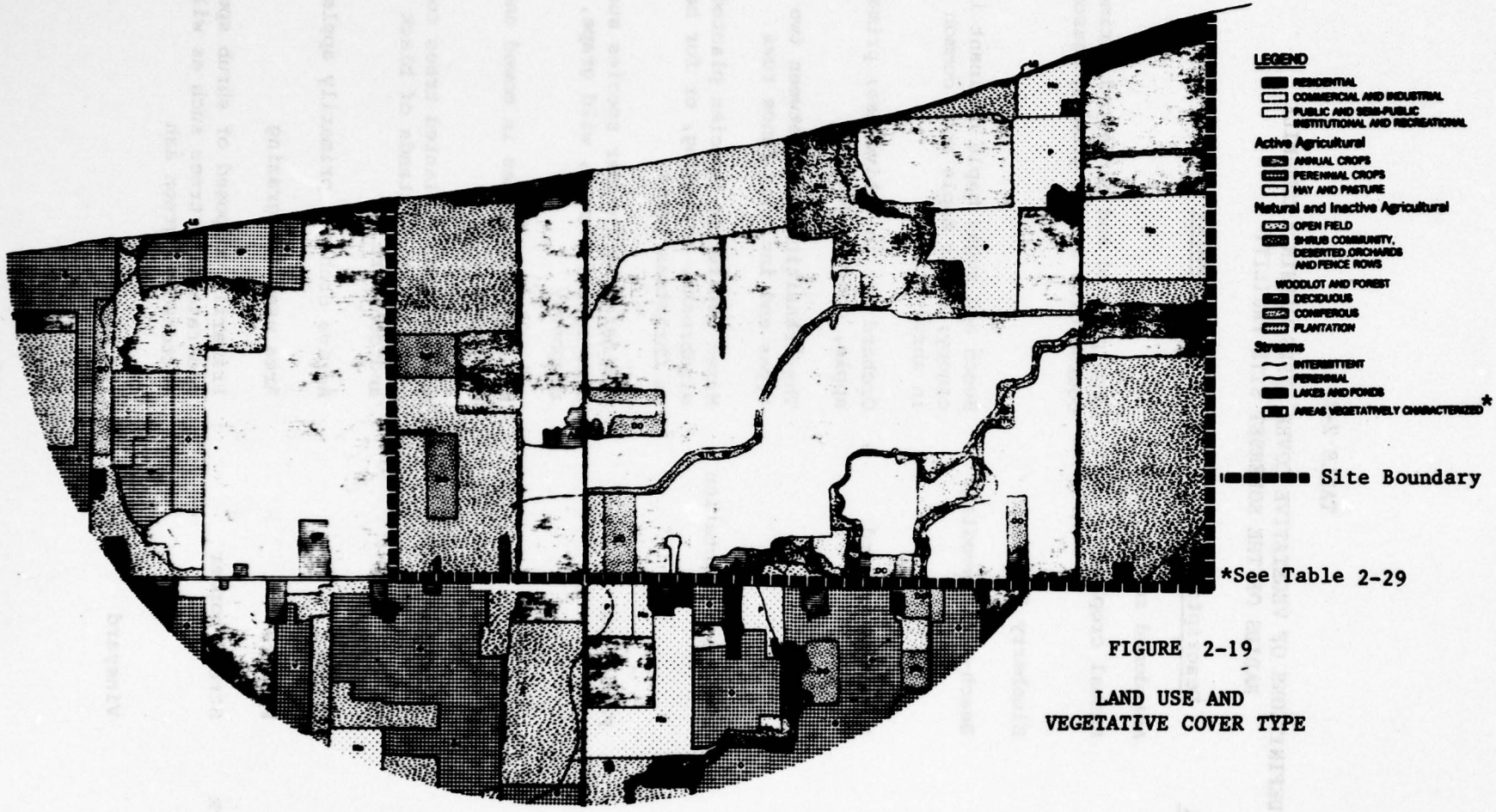


FIGURE 2-19

LAND USE AND
VEGETATIVE COVER TYPE

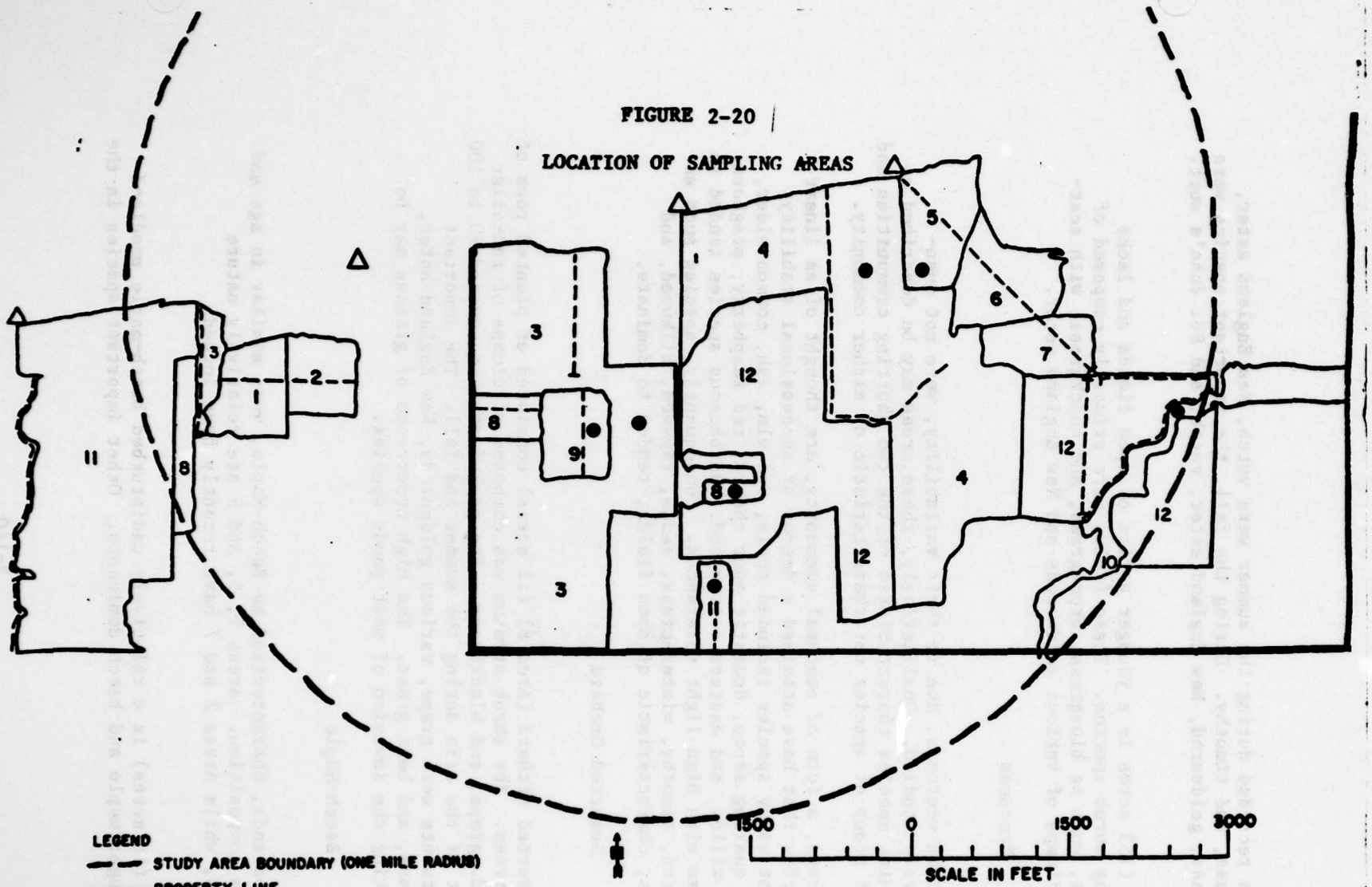
TABLE 2-29

DEFINITIONS OF VEGETATIVE COVER TYPES WITHIN A ONE-MILE RADIUS OF THE SOMERSET SITE FACILITY

Symbol	Description	Remarks
A	Abandoned residential	
AC	Annual cropland	Crop planted and harvested during the course of a single growing season
Bl	Blueberry field	
BM	Beech-maple woodland	Beech and sugar maple dominant in the canopy; sugar maple most common plant in shrub stratum
DO	Deserted orchard	Orchard not in active use; primarily apple, cherry, or pear
E	Ecotone	The transition area between two cover types and includes fence rows
EP	Evergreen plantation	Mixed coniferous species planted for windbreaks, screening, or for harvest as Christmas trees
F	Fence row	Dominated by invader species such as elm, apple, cherry, wild grape, and raspberry
Ha	Hay	Area in which grass is mowed and used as forage
LS	Lakeshore	Narrow band of planted trees consisting of alternating stands of black locust and conifers
O	Orchard	Active orchard, primarily apple or cherry
P	Pasture	Area used for grazing
STR	Stream border	Primarily composed of shrub species and moderate-size trees such as willow, cottonwood, green ash
V	Vineyard	

FIGURE 2-20

LOCATION OF SAMPLING AREAS



species recorded during the summer were vetch, New England aster, bluegrass, and timothy. During the fall, the important species were bluegrass, goldenrod, New England aster, vetch, and St. John's wort.

2.275
Area 4 (153 acres is a younger series of open fields and lacks invading shrub species. These fields were primarily composed of grasses, such as bluegrass, bromegrass, and quackgrass, with scattered clumps of various goldenrods and New England aster.

Ecotones

2.276
Vegetative ecotones, due to their variability, were not quantitatively studied. Qualitatively, these areas may be described as containing species characteristic of the two abutting communities and a third group of species not characteristic of either community.

Fence rows, a form of ecotonal community, are thought of as linear old fields that have attained a degree of successional stability. Abundant woody species included apple, red elm, ash, common elder, grape, quaking aspen, domestic sour cherry, red raspberry, staghorn sumac, willow, and eastern cottonwood. Herbaceous species tended to be those with high light tolerances. Consequently, species such as goldenrod, timothy, winter-cress, sedge, ragweed, milkweed, and alfalfa, characteristic of open fields, tended to dominate.

Deserted Orchard

2.277
The deserted orchard (Area 8) (12 acres) consisted of planted rows of apple trees. The shrub stratum was composed of clumps of red-osier dogwood. grape, and blackberry. The ground stratum covered 90 to 100 percent of the area during the summer and fall. The important constituents were grape, various goldenrods, New England aster, bluegrass, and bent grass. The high occurrence of grasses may be inhibiting the invasion of most woody species.

Beech-Maple

2.278
The woodlands, characterized as Beech-Maple, were similar in age and species composition. Areas 1, 5, and 9 are relatively mature forests, while Areas 2 and 7 have recently been logged.

2.279
Area 1 (16 acres) is a relatively undisturbed beech-maple woodland with sugar maple and beech dominants. Other important species in the

canopy included basswood, white ash, white pine, and Scotch pine. The subcanopy was also dominated by sugar maple and beech. Sugar maple, beech, and hop-hornbeam were dominants in the shrub stratum. Dogtooth violet and ramps were the important spring ground stratum species. During the summer, the most frequent species were Jack-in-the-pulpit, ramps, enchanter's nightshade, blue cohosh, and false lily-of-the-valley. Fall species included enchanter's nightshade, ramps, aster, and bittersweet nightshade.

2.280
In Area 2 (12 acres) sugar maple was recently removed by logging, and beech subsequently has dominated. The subcanopy consisted of sugar maple, beech, hop-hornbeam, white ash, and horse-chestnut.

There was a dense undergrowth of raspberries, blackberries, and bittersweet nightshade growing over the slash.

2.281
Area 5 (21 acres) is a fairly mature beech-maple woodland that has not been disturbed in recent years by logging. Beech, sugar maple, and white ash dominated the canopy stratum. Several small patches of paper birch were on the edges of the woodlot. The shrub stratum was dominated by sugar maple, beech, and hop-hornbeam. Herbaceous species included Jack-in-the-pulpit and waterleaf.

2.282
Area 6 (15 acres) is a beech-maple woodland with a small section of evergreen plantation. Canopy dominants were beech and white ash. There was a dense thicket of apple, hawthorn, and ash surrounding the pond. The herbaceous layer was dominated by bluegrass and dog-tooth violet.

2.283
Area 7 (13 acres) has been logged, and the canopy stratum consisted almost entirely of beech. The codominants of the subcanopy were sugar maple and beech. Sugar maple, common elder, beech, and white ash were common in the dense shrub stratum. Dog-tooth violet was abundant in the ground stratum in the spring. Predominant species in the fall were sugar maple seedlings and aster.

2.284
Area 9 (13 acres) is predominantly beech and silver maple. The dense shrub stratum was dominated by sugar maple, beech, white ash, grape, and hornbeam. The ground stratum was sparse during the year because of the dense canopy and shrub strata.

Evergreen Plantation

2.285
A young evergreen plantation in the northwest corner of the site consisted of red pine, blue spruce, white fir, and red spruce. Height of the canopy ranged from 3 to 10 feet. The dense ground stratum consisted of asters, goldenrods, and Kentucky bluegrass.

Stream Border

2.286
The stream border (Area 10) (12 acres) extends across the southeast corner of the site. The habitat type varies in width, narrowing as it proceeds in the southern direction. The dominant trees were green ash and cottonwood. The sparse shrub stratum was composed of raspberry and rose. Touch-me-not, sedge, water plantain, sour dock, and loosestrife formed the ground stratum along the stream bank.

Ponds

2.287
A large pond is located north of Lake Road between Potter and Hosmer Roads. Twenty-five percent of the pond surface was covered by a bluegreen algal mat, floating-leaf pondweed, and sago pondweed. The shoreline was covered by a dense growth of grasses which included reed canary grass, rice cut grass, orchard grass, spike rush, and timothy. Grape, apple, hawthorn, and black cherry formed the shrub stratum. An overstory stratum consisted of Scotch pine, larch, and hawthorn. Two small ponds are located east of Potter Road along Fish Creek. The westernmost pond had a dense canopy of cottonwood and willow. The shrub stratum was willow. The ground stratum was very sparse. The easternmost pond had a sparse canopy of willow and cottonwood and a sparse shrub stratum of willow. The ground cover was very dense, consisting of cattail, sedges, and great bulrush along the shoreline.

Active Orchard

2.288
Area 11 (7 acres) is an active apple orchard.

Active Agriculture

2.289
Area 12 (48 acres) is active agricultural land planted in corn, wheat, and hay.

2.289a
Natural vegetation exhibited slight changes in species composition and density between fall 1974 and spring 1976. Based on past land use practices for the site and literature concerning secondary succession, these changes were considered normal progressions for the plant communities present. The deserted orchards and open fields had increased numbers of forb and shrub species (e.g., goldenrod, aster, red raspberry, and red-osier dogwood), and decreasing grass cover (e.g., bluegrass and redtop).

In the mature beech-maple woodlands (Areas 1, 5, 6, and 9) which had not been disturbed in recent years, no significant changes were noted. The recently logged (1973) beech-maple woodlands (Areas 2 and 7) experienced changes in species composition and increased species densities in the understory. Light tolerant species (e.g., aster, goldenrods, red raspberry, and common elder) increased in frequency in the ground and shrub strata. Seedlings and saplings of sugar maple, beech, wild cherry, and white ash increased in density and growth rate.

Areas qualitatively characterized (e.g., ecotones, evergreen plantation stream border, ponds, and lakeshore) also exhibited only minor advances in succession. The greatest vegetative change in the site was the reduction in the open field cover type because of increased agricultural activity.

Lakeshore

2.290
Vegetation along the bluffs of the lakeshore is variable in composition. Alternating bands of coniferous and decidous trees extend from the west site boundary to Hosmer Road. The deciduous trees included black locust, willow, and basswood, and the coniferous species included red pine, Austrian pine, Norway spruce, blue spruce, red spruce, and European larch. The dense ground stratum was dominated by grasses, goldenrods, and asters. The bluffs along Area 4 were composed of open field species of grasses and various goldenrods. The vegetation between the east edge of Area 5 and Potter Road consisted of black locust and hawthorn in the canopy and shrub strata.

Estimate of Site Productivity

2.291
The soils on the Somerset Site have a good potential productivity rating, with 61 percent of the site classified as "good," based on

existing information on soil texture, drainage, available moisture capacity, nutrient-supplying power, depth to bedrock of fragipan, slope, and erosion potential. About 37 percent of the site has a rating of "fair to good."

The potential productivity ratings assigned to each unit are based on the above soil features with no consideration given to management practices. A rating of "good" indicates that under natural conditions, trees of superior form and growth rate would dominate. A rating of "fair" indicates trees of good form and moderate growth. A rating of "poor" indicates that form and growth generally would be poor.

Erosion hazard is slight on 99 percent of the site.

Railroad/Transmission Corridor

2.292

The railroad/transmission corridor extends about 1.3 miles from the intersection of Hosmer and Lake Roads to the existing railroad line in West Somerset, and is approximately 0.3 miles in width (Figure 2-21). Active agricultural land, open fields, deserted orchards, streamborder, and woodlands are the primary cover types. Most of the open fields and deserted orchards were abandoned in 1974. Specific transmission and rail routes have not yet been determined, and projected impacts are associated with only one of the four or more alternatives.

Terrestrial Fauna

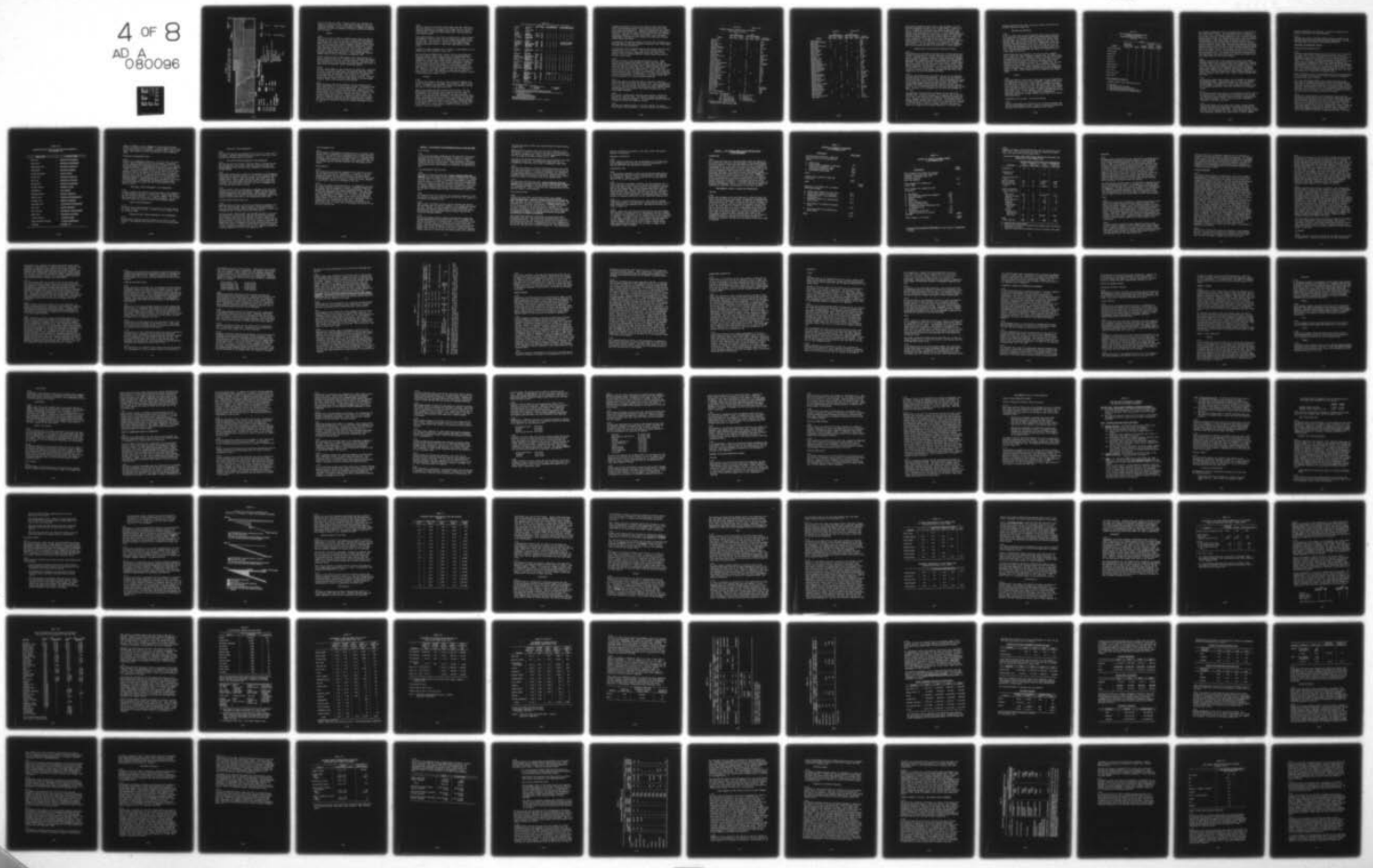
2.293
The terrestrial fauna of the Somerset Site was studied to determine species composition, distribution, and indices of abundance. The mammal sampling program used live traps for small mammals and observations for medium and large mammals. Birds were observed using belt transects and time area counts. Reptiles and amphibians were censused by observations, including sampling in temporary pools. Insect studies were limited to obtaining information on economically important groups.

2.294
No unique animal usage of the site was observed. There were no concentrated breeding sites or feeding areas on the site. Agricultural waste grain was available. No migration routes were identified. Wooded areas, ecotones, pastures, hay fields, and fence rows provided cover, while agricultural areas did not. Water was available for

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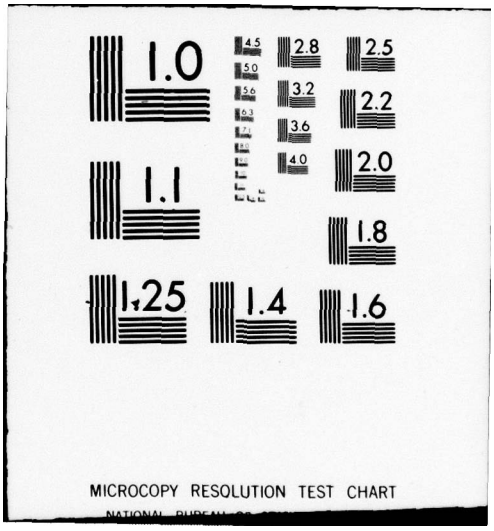
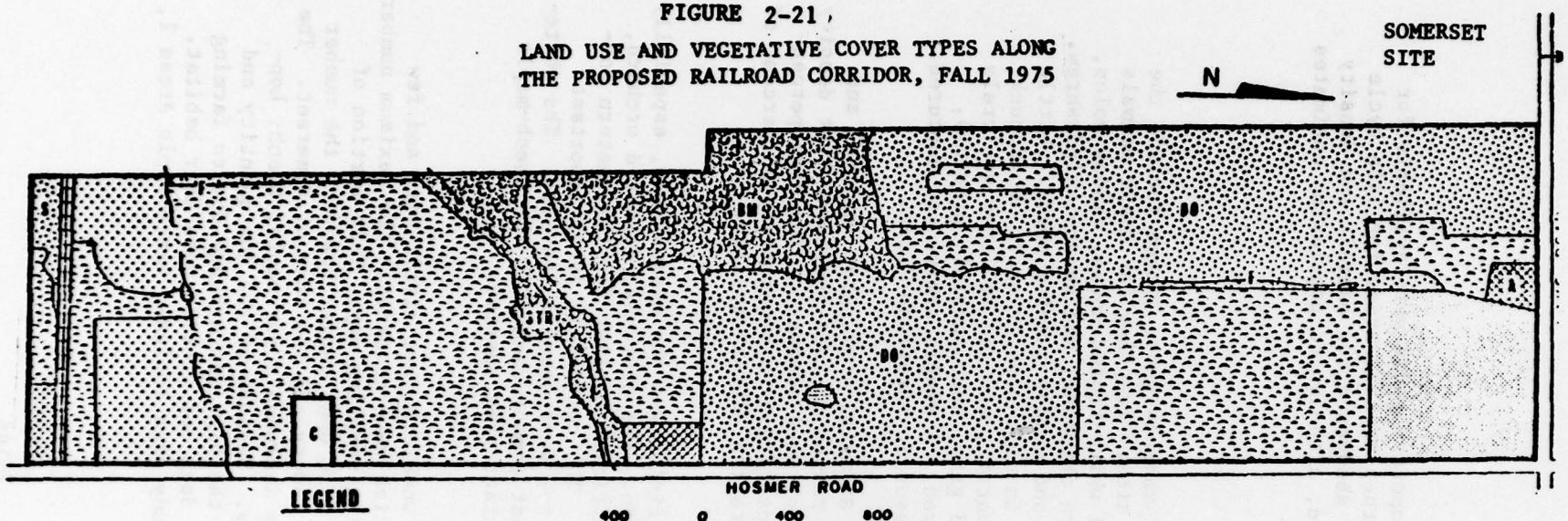

1.0
1.1
1.25
1.4
1.6
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MICROCOPY RESOLUTION TEST CHART

FIGURE 2-21

LAND USE AND VEGETATIVE COVER TYPES ALONG THE PROPOSED RAILROAD CORRIDOR, FALL 1975



LEGEND

- RESIDENTIAL
  - A = Abandoned
- ANNUAL CROP
- HAY
- OPEN FIELD
- SHRUB COMMUNITY
  - DO = DESERTED ORCHARD
  - F = FENCEROW
- WOODLAND
  - STR = STREAMBORDER
  - BM = BEECH - MAPLE
- POND
- STREAM
- RAILROAD
- C CEMETERY

Land Use	Area (Acres)	Percent of Total Area
Residential (Active and Abandoned)	4	2
Railroad	2	<1
Active Agricultural Land		
Annual Cropland	12	5
Hay and Pasture	11	5
Natural Vegetation and Inactive Agricultural Land		
Open Field	92	41
Shrub Comminity	1	<1
Deserted Orchard	71	32
Fencerow	2	<1
Woodland	19	8
Streamborder	6	3
Pond	<1	<1
Total	221	100

most of the year in streams. Temporary ponds were available for amphibian reproduction, but no other special areas for life cycle stages were present. Indices of abundance for mammals and density estimates for birds were prepared, although no population estimates were calculated.

Mammals

2.295
Twenty-five of the 47 species of mammals whose ranges include the Somerset Site were found on the site. Trapping for small mammals with Sherman live traps captured white-footed mouse, meadow moles, masked shrew, deer mouse, eastern chipmunk, and short-tailed shrew. Pit traps collected smoky shrew and meadow jumping mouse. Little brown bats were either captured in mist nets or shot. Woodchuck, white-tailed deer, eastern cottontail, and red and gray squirrels were seen. Sign of fox (red and gray, both possibly present), opossum, and raccoon were observed. A single ermine was captured. Mammals found in 1975 are discussed in paragraph 2.298.

Habitat quality rating for game animals, deer, gray squirrel and eastern cottontail was fair. A rating of fair indicates that density and distribution of food and cover were adequate. The high percentage of agricultural land and open field (approximately 85 percent of area within site boundary) limits the habitat quality.

2.296
The most common mammal in open fields was the meadow vole, especially in areas of low grassy vegetation. The ecotones, deserted orchard, and stream border provided significant habitat for the eastern cottontail and white-footed mouse. The cottontail is an important recreational species, although few were seen on the site. The white-footed mouse was perhaps the most common mammal in the beech-maple woodlots, where it was an important prey species.

2.297
White-tailed deer utilized the woodlots, but little sign and few direct observations of the species were recorded. The maximum number observed was two deer on a spring sampling day. This portion of western New York is considered fair deer range; however, the number killed appears low for Niagara County and the town of Somerset. The primary browse plants available included sugar maple, beech, hop-hornbeam, grape, and poison ivy. Because of the low quantity and quality of available foods and the high disturbance due to farming activities, the site generally does not provide good deer habitat. The best habitat within the study area included beech-maple Areas 2, 6, and 7.

2.298
Bats are common in the woodlots during summer when they function as important components of the food web by eating insects. The little brown bat was collected in August, and at least two other unidentified species of bats were noted flying about. Most activity was noted near the ponds.

Gray squirrel habitat on the site was limited due to a low diversity and quantity of winter foods. The only common mast-producing tree was the beech. The other food species included sugar maple, blackberries, corn, and conifers. A relatively large number of gray squirrels was noted in Area 7, which had a high density of beech trees.

Estimates of mammal abundance and the quality of their habitat at the Somerset Site are presented in Table 2-30.

Six new species of mammals were verified in 1975 (star-nosed mole, hoary bat, muskrat, house mouse, ermine, and long-tailed weasel), bringing the total number of mammal species verified to 25. In a comparison of January 1974 through December 1974 data with that from January 1975 through January 1976, species composition at Somerset Site was found to be similar between years and seasons. The white-footed mouse and meadow vole appeared to reach higher population levels in 1975. The cottontail and gray squirrel appreared to be more common in 1975 and were present in most areas of suitable habitat. The white-tailed deer appeared to visit the site more frequently than in 1974. About five deer were observed regularly during the spring and early summer of 1975.

Avifauna

2.299
A total of 203 species of birds has been recorded at Somerset Site; 182 in the spring, 89 in the summer, 150 in the fall, and 57 in the winter. One Hundred and eighty bird species were observed from the late fall of 1973 through the fall of 1974.

Twenty-three species recorded during the period winter 1974-1975 through winter 1975-1976 were new records for the site. Most of these species were transient wading birds or winter visitants. A number of the breeding birds recorded in 1975 were new for the summer census, including one species of waterfowl (wood duck), and one blue listed species (Henslow's sparrow). The number of species recorded in each of the seasons was fairly similar to that of previous years; 152 in spring 1975, 153 in 1974; 77 in summer 1975, 74 in 1974; 136 in fall 1975, 120 in 1974; and 40 in winter 1975-1976, and 39 in 1974-1975, and 38 in 1973-1974.

TABLE 2-30

MAMMALS OF THE REGION AND ESTIMATES OF THEIR ABUNDANCE AND QUALITY OF THEIR HABITATS ON THE SOMERSET SITE, 1974 THROUGH 1976

Common Name[a]	Scientific Name[a]	Primary Habitat Type[b]	Primary Habitat Quality[c]	Seasonal Abundance[d] 1974 Winter	Spring	Summer	Fall	Seasonal Abundance[d] 1975-1976 Winter	Spring	Summer	Fall	Winter
Marsupials	**MARSUPIALIA**											
Opossum	Didelphis virginiana	All	Fair	1	1	1	1	1	1	0	0	1
Insectivores	**INSECTIVORA**											
Masked Shrew	Sorex cinereus	OF,E,S,B-SH	Good	0	1	1	0	1	1	0	1	0
Smoky Shrew	S. fumeus	B-SH	Fair	0	0	1	0	0	0	0	0	0
Least Shrew	Cryptotis parva	OF	Fair	0	0	0	0	0	0	0	0	0
Short-tailed Shrew	Blarina brevicauda	OF,E,S,BO, B-SH,STR	Good	0	0	1	1	0	0	1	2	1
Star-nosed Mole	Condylura cristata	e	Fair	0	0	0	0	1	0	1	1	0
Hairy-tailed Mole	Parascalops breweri	e	Fair	0	0	0	0	0	0	0	0	0
Bats	**CHIROPTERA**											
Little Brown Myotis	Myotis lucifugus	B-SH,P	Good	0	0	1	0	Bats were observed but species composition was not determined (the presence of the hoary bat was verified on the site).				
Keen's Myotis	M. keenii	B-SH,P	Good	0	0	0	0					
Small-footed Myotis	M. leibii	B-SH,P	Poor	0	0	0	0					
Silver-haired Bat	Lasionycteris noctivagans	B-SH,P	Good	0	0	0	0					
Eastern Pipistrelle	Pipistrellus subflavus	B-SH,P	Poor	0	0	0	0					
Big Brown Bat	Eptesicus fuscus	B-SH,P	Good	0	0	0	0					
Red Bat	Lasiurus borealis	B-SH,P	Good	0	0	0	0					
Hoary Bat	Lasiurus cinereus	B-SH,P	Good	0	0	0	0	0	1	1	0	0
Lagomorphs	**LAGOMORPHA**											
Eastern Cottontail	Sylvilagus floridanus	E,S,BO,STR,O	Good	2	2	2	2	2	3	3	1	3
Snowshoe Hare	Lepus americanus	None		0	0	0	0	0	0	0	0	0
Rodents	**RODENTIA**											
Eastern Chipmunk	Tamias striatus	B-SH	Good	0	1	1	1	0	1	1	1	0
Woodchuck	Marmota monax	OF,E,BO,S, B+P,STR	Fair	0	3	3	3	0	3	0	0	0
Gray Squirrel	Sciurus carolinensis	B-SH	Fair	2	2	1	1	2	2	1	0	1
Red Squirrel	Tamiasciurus hudsonicus	B-SH	Fair	2	0	1	1	2	1	0	1	1
Southern Flying Squirrel	Glaucomys volans	B-SH	Poor	0	0	0	0	0	0	0	0	0
Northern Flying Squirrel	G. sabrinus	B-SH	Poor	0	0	0	0	0	0	0	0	0
Beaver	Castor canadensis	STR,L	Poor	0	0	0	0	0	0	0	0	0
Deer Mouse	Peromyscus maniculatus	OF	Good	0	2	2	2	0	2	0	2	1
White-footed Mouse	P. leucopus	E,S,BO,STR, B-SH	Good	3	3	4	4	4	3	3	4	4
Southern Red-backed Vole	Clethrionomys gapperi	B-SH	Poor	0	0	0	0	0	0	0	0	0
Meadow Vole	Microtus pennsylvanicus	OF,BO,B+P,O	Good	4	4	3	4	4	3	3	4	4
Woodland Vole	M. pinetorum	BO,B-SH	Fair	0	0	0	0	0	0	0	0	0
Muskrat	Ondatra zibethicus	STR,P	Fair	0	0	0	0	1	1	0	0	0
Southern Bog Lemming	Synaptomys cooperi	OF	Poor	0	0	0	0	0	0	0	0	0
House Mouse	Mus musculus	OF,Buildings	Fair	0	0	0	0	0	0	0	0	1
Norway Rat	Rattus norvegicus	Buildings	Fair	0	0	1[e]	0	0	0	0	0	1
Meadow Jumping Mouse	Zapus hudsonius	OF,E	Good	0	0	1	0	0	1	0	0	0
Woodland Jumping Mouse	Napaeozapus insignis	E,B-SH	Fair	0	0	0	0	0	0	0	0	0
Porcupine	Erethizon dorsatum	B-SH	Poor	0	0	0	0	0	0	0	0	0
Carnivores	**CARNIVORA**											
Red Fox	Vulpes vulpes	All	Good	Fox sign observed but species undetermined.								
Gray Fox	Urocyon cinereoargenteus	All	Fair					(3	3	1	1	3)[g]
Raccoon	Procyon lotor	All	Fair	2	2	1	2	2	3	1	2	0
Ermine[h]	Mustela erminea	All	Good	0	0	0	0	0	0	0	1	1
Long-tailed Weasel	M. frenata	All	Good	0	0	0	0	0	0	0	0	1
Mink	M. vison	STR,B-SH	Poor	0	0	0	0	0	0	0	0	1
Striped Skunk	Mephitis mephitis	All	Good	3	3	1	0	0	0	0	0	0
River Otter	Lontra canadensis	None		0	0	0	0	0	0	0	0	1
Bobcat	Lynx rufus	B-SH	Poor	0	0	0	0	0	0	0	0	0
Coyote	Canis latrans	All	Poor	0	0	0	0	0	0	0	0	0
Even-toed Ungulates	**ARTIODACTYLA**											
White-tailed Deer	Odocoileus virginianus	All	Fair	2	2	1	1	2	3	3	3	2

[a]Nomenclature follows Jones, et al.(21)

[b]Cover - types available (see Table 79.1-2-S for descriptions)

OF	- Open Field	B-SH	- Beech-Sugar Maple Community	STR	- Stream Community
E	- Ecotone	AC	- Annual Cropland	P	- Pond Community
S	- Shrub Community	H+P	- Hay and Pasture	L	- Lakeshore
BO	- Deserted Orchard	O	- Active Orchard		

[c]Habitat Quality

Poor - Quality and quantity of food and cover inadequate; probably could not survive there

Fair - Density and distribution of food and cover adequate; probably could survive there

Good - Quality, density and distribution of food and cover more than adequate; probably could survive there and do well

[d]Abundance - Based on direct observation and sign

0 - Not found on site

1 - Present but abundance unknown

2 - Low, partial use of available habitat

3 - Moderate, found throughout available habitat

4 - High, approaching capacity of available habitat

[e]Abundance of moles is primarily effected by soil conditions

[f]Specimen found in pellet of barn owl roosting on site

[g]Both species of fox were observed on the site, but the ratio of red to gray was not determined

[h]Specimen captured during preliminary survey, Fall 1973

Although all habitats on the site were used by birds, the stream border and beech-maple woodlots were among the most heavily used, particularly during migration. Summer bird populations were predominantly grassland species (e.g., savannah, grasshopper, and Henslow's sparrows). Game species common on or adjacent to the site included ring-necked pheasants, which are present year round, and migrant Canada geese, thousands of which rested on the lake (peak of about 20,000) during the spring.

Ten percent of the species recorded on the site were permanent residents and most of these were woodland inhabitants (e.g., black-capped chickadee and downy woodpecker).

Tree sparrows, which frequented woodlots and ecotones, were the most abundant species in the winter. Open fields and agricultural croplands were relatively unimportant avian cover types in this season. Only the hardiest waterfowl and gull species were seen on the lake in the winter.

2.300
The site is within a major spring hawk migration route. Hawks usually avoid crossing large bodies of water; thus they tend to follow the south shore of Lake Erie and Lake Ontario, moving eastward along the lakes with prevailing winds. Migrating hawks turn north after skirting the southern edge of Lake Erie, and strike Lake Ontario in the region of the Somerset site. Because these birds are concentrated into this area from a broad migration front, large numbers occur each spring. Although most of the hawks continue eastward along the southern shore of Lake Ontario, a few pass between Lake Erie and Lake Ontario in their northward migration.

2.301
Sixty-seven species of birds are known or presumed to have bred within the study area during 1974 (Table 2-31). Major breeding habitats on the site include open fields which are used by grassland species (e.g., savannah sparrow), and beech-sugar maple woodlots used by woodland species (e.g., eastern wood pewee, red-eyed vireo, and black-capped chickadee).

2.302
Many species, predominantly blackbirds and sparrows, utilized the ecotones for food and cover. The deserted orchard was important habitat for ring-necked pheasant. The beech-maple woodlots supported the greatest density and number of species.

2.303
The lake and lakeshore appeared to be most important for gulls, diving ducks, and Canada geese. During the winter, only the hardier

TABLE 2-31 (Page 1 of 2)

ESTIMATED ABUNDANCE OF BREEDING BIRDS ON THE SOMERSET SITE DURING 1974 AND 1975

Species	1974 Estimated Abundance 1-5 Pairs	1974 Estimated Abundance 6-15 Pairs	1974 Estimated Abundance Over 15 Pairs	1975 Estimated Abundance 1-5 Pairs	1975 Estimated Abundance 6-15 Pairs	1975 Estimated Abundance Over 15 Pairs	Breeding Habitat Type[a]
Green Heron[b]				X			B-SM
Mallard	X			X			Str
Wood Duck[b]				X			B-SM, P
Red-tailed Hawk	X			X			B-SM
Marsh Hawk	X			X			OF
American Kestrel	X			X			E, B-SM
Ring-necked Pheasant			X			X	OF
Killdeer	X			X			AC
American Woodcock		X			X		B-SM
Spotted Sandpiper	X			X			P
Rock Dove	X			X			Residential
Mourning Dove		X			X		DO, E
Yellow-billed Cuckoo[c]	X						B-SM
Barn Owl[c]	X						Residential
Screech Owl	X			X			B-SM
Great Horned Owl	X			X			B-SM
Chimney Swift[b]				X			Residential
Ruby-throated Hummingbird	X			X			DO, B-SM
Belted Kingfisher	X			X			L
Common Flicker	X			X			B-SM
Red-bellied Woodpecker[b]				X			B-SM
Hairy Woodpecker[c]	X						B-SM
Downy Woodpecker		X		X			B-SM
Eastern Kingbird			X		X		E, DO
Great Crested Flycatcher		X			X		B-SM
Eastern Phoebe	X			X			Str
Acadian Flycatcher[c]	X						B-SM
Willow Flycatcher	X			X			DO
Least Flycatcher	X			X			Str
Eastern Wood Pewee			X			X	B-SM
Horned Lark	X			X			AC
Tree Swallow	X			X			L
Bank Swallow[b]				X			L
Rough-winged Swallow[b]				X			P
Barn Swallow	X				X		Residential
Purple Martin	X			X			Residential
Blue Jay	X			X			B-SM
Common Crow	X			X			B-SM
Black-capped Chickadee		X		X			B-SM

[a] Cover Types: OF - Open Field; E - Ecotone; SS - Shrub Community; DO - Deserted Orchard; B-SM - Beech-Sugar Maple; AC - Annual Crop Land; H&P - Hay and Pasture; O - Orchard; Str - Stream Border; P - Pond Community; L - Lake Shore and Lake

[b] Species observed in 1975 but not in 1974

[c] Species observed in 1974 but not in 1975

TABLE 2-31 (Page 2 of 2)

Species	1974 Estimated Abundance 1-5 Pairs	6-15 Pairs	Over 15 Pairs	1975 Estimated Abundance 1-5 Pairs	6-15 Pairs	Over 15 Pairs	Breeding Habitat Type[a]
Tufted Titmouse	X			X			B-SM
White-breasted Nuthatch	X			X			B-SM
House Wren			X		X		B-SM
Winter Wren[c]	X						B-SM
Short-billed Marsh Wren	X			X			OF
Mockingbird	X			X			Str
Gray Catbird		X			X		E, Str
Brown Thrasher[b]				X			B-SM
American Robin		X				X	DO, B-SM
Wood Thrush		X			X		B-SM
Eastern Bluebird[b]				X			DO, O
Cedar Waxwing		X			X		DO, E
Starling			X			X	E, B-SM
Red-eyed Vireo			X			X	B-SM
Warbling Vireo[b]				X			
Yellow Warbler			X			X	E, Str
Magnolia Warbler[b]				X			B-SM
Cerulean Warbler	X			X			B-SM
Chestnut-sided Warbler[b]				X			E
Mourning Warbler	X			X			B-SM
Common Yellowthroat			X			X	E, Str
Yellow-breasted Chat[c]	X						S, DO
American Redstart[b]				X			E
House Sparrow			X			X	Residential
Bobolink			X			X	OF, H&P
Eastern Meadowlark			X			X	OF, H&P
Red-winged Blackbird			X			X	PF, E, Str
Northern Oriole		X			X		B-SM, Str
Common Grackle			X			X	B-SM
Brown-headed Cowbird			X			X	All
Scarlet Tanager	X			X			B-SM
Cardinal		X			X		B-SM
Rose-breasted Grosbeak[b]				X			B-SM
Indigo Bunting			X			X	E
American Goldfinch			X			X	B-SM, DO
Savannah Sparrow			X			X	OF, H&P
Grasshopper Sparrow		X			X		OF
Henslow's Sparrow[b]					X		OF
Vesper Sparrow[c]	X						OF
Chipping Sparrow	X			X			E
Field Sparrow			X			X	E, DO
White-throated Sparrow[b]				X			OF, E
Song Sparrow			X			X	E, DO, Str

diving ducks (primarily greater scaup, common goldeneye, and red-breasted mergansers) and gulls occur on Lake Ontario. However, the lake is an important resting area for migratory waterfowl in the spring. Between 22 and 26 April 1974, 10 to 15,000 Canada geese roosted on the lake adjacent to the site. Several hundred geese were observed feeding on waste corn and volunteer grasses in cornfields during the spring; geese also feed on winter wheat and other cover crops. Summer use of the lake by birds was limited primarily to ring-billed gulls. An increase in the number of waterfowl using the lake occurred in the fall, but use at this season was less than during spring. Very few shorebirds were observed on the lakeshore, which is too narrow and stony to be attractive to these species.

Recreationally and Economically Important Species

2.304
The importance of the Somerset Alternate Site for avian species considered of recreational or economic importance in New York was evaluated. Blackbird species, capable of causing agricultural damage, were considered economically important, whereas waterfowl and upland gamebirds were classified as both recreationally and economically important. Waterfowl, important to New York hunters, include Canada geese, black duck, mallard, wood duck, lesser scaup, greater scaup, American goldeneye, and bufflehead. The site is used by these species primarily as a resting area. The only waterfowl species known to nest on the site is the mallard, although the black duck, blue-winged teal, and wood duck might breed there.

2.305
The only upland game species ocurring on the site are the American woodcock and the ring-necked pheasant. Woodcock use the woodlots, particularly Area 6, as breeding cover, while the combination of open fields, deserted orchards, and ecotones provides good pheasant habitat although pheasant populations have declined. The town of Somerset lies within the best pheasant range in New York, and densities of 10 to 50 pheasants/100 acres have been reported here in the past. A density of 11.6 pheasants per 100 acres was estimated for the site.

The NYDEC has no recent hunter use figures for the area of the Somerset Site. The hunter pressure in the general area of the site is low due to the decline in the pheasant population throughout the area. The cause of the decline is unknown. The Regional Wildlife Manager (NYDEC) estimated that annally one to three hunters a day can be expected on each 100 acres of land that is available for hunting, and no land onsite is open for hunting, therefore, resulting in little or no impact to the wildlife resources. In the past, when

pheasant populations were high, the annual hunters use would be ten to twenty times the present use.

Reptiles and Amphibians

2.306
Of the 20 reptile species and 20 amphibian species that could occur in the site area, four reptile species and seven amphibian species were observed. The snapping turtle, painted turtle, garter snake, and milk snake were the reptile species observed on the site. The American toad, leopard frog, chorus frog, spring peeper, bullfrog, and green frog were observed on the site. Tadpoles of all but the chorus frog and spring peeper were observed in temporary pools on site, along the streambanks and the pond of the eastern edge of the site. The red-backed salamander was found in the woodlots of the eastern edge of the site.

Species which were not observed on the site, but which probably occur, include the slimy salamander, pickerel frog, rat snake, racer, and northern water snake. Painted turtles were observed in the mouth of Eighteenmile Creek, six miles west of the site. Relative abundance and preferred habitats of reptiles and amphibians of the Somerset Site are presented in Table 2-32. In August 1975, the common garter snake, American toad, and leopard frog were found in several cover types. The steam and ponds, Area 10, had a high population of leopard frogs, and the woodlands and ecotones had moderate numbers of toads. Garter snakes were low in numbers in all upland areas.

Insects

2.307
Population numbers of plant insect pests were low and no significant crop damage was noted at the time of sampling. Insects found on the site that might be expected to cause local or regional crop losses are eastern tent caterpillar, cereal leaf beetle, meadow spittlebug, potato leafhopper, cherry fruit fly, and codling moth. Only economically important insects were studied in detail, although many other species were seen. Project impacts on these populations and the food chain they are part of, are not expected to be significant. Additional information on insect studies can be found in the Article VIII application.

Transmission Line Corridor - Terrestrial Ecology

2.308
Specific transmission line routes have not yet been determined, and the following paragraphs present a generic discussion of terrestrial ecology in the vicinity at the transmission line corridor.

TABLE 2-32

RELATIVE ABUNDANCE AND PREFERRED HABITATS
OF AMPHIBIANS AND REPTILES
WHICH WERE OBSERVED AT THE SOMERSET SITE
1974-1975

Species	Habitats				
	Beech-Sugar Maple Forest (2,5,6,7,9)[b]	Ecotone	Orchards (8,11)[b]	Open Fields & Annual Cropland (3,4,12)	Stream and Ponds (10)[b]
Red-backed Salamander	2	0	0	0	0
American Toad	3	3	2	2	2
Leopard Frog	2	2	0	2	4
Green Frog	0	0	0	0	2
Bullfrog	0	0	0	0	2
Chorus Frog	1	0	0	0	1
Snapping Turtle	0	0	0	0	1
Painted Turtle	0	0	0	0	1
Garter Snake	2	2	2	2	0
Eastern Milk Snake	1	1	1	0	0
Spring Peeper	0	0	0	0	1

[b] Areas designated on FIGURE 2-21

Abundance - Based on direct observations and sign

0 - Not found
1 - Present but abundance unknown
2 - Low, partial use of available habitat
3 - Moderate, found throughout available habitat
4 - High, approaching capacity of available habitat

The proposed transmission lines are located within the New York State Lake Plain Forestry Region. From the Somerset Site to Ridge Road (U. S. Route 104), the proposed transmission lines will traverse the Ontario Shore Subregion and from Ridge Road south to PASNY's existing Niagara-Rochester line, the proposed right-of-ways cross the Niagara-Erie-Subregion. These forest areas are composed primarily of northern hardwoods and softwoods and associated southern hardwoods. Northern hardwoods include sugar maple, American basswood, white ash, American beech and quaking aspen. Northern softwoods include eastern hemlock and white pine, and the associated southern hardwoods include white oak, shagbark hickory, silver maple, and eastern cottonwood. Most of the forest cover in the transmission project area is located where drainage is poor. The dominant tree species found growing in wet areas include red maple, silver maple, white ash, eastern cottonwood, swamp white oak, and eastern hemlock.

2.309
Vegetation associations of the transmission project area include cropland, pasture, inactive agriculture, shrub communities, wetlands, and forest land. Woody understory species in forested areas include spicebush, viburnum, hop hornbeam, American hornbeam, and witch hazel. Shrub communities are composed primarily of gray dogwood, meadowsweet, staghorn sumac, hawthorn, and viburnum. Herbaceous plants found on inactive agricultural lands include goldenrod, aster, grasses, milkweed, Queen Anne's lace, chicory, teasel, blackberries, and ferns.

2.310
Deciduous wood swamps, shrub swamps, and wet meadows are crossed by the proposed routes. These wetland types are typical of wetlands found throughout the transmission project area, and although no detailed study of wetlands in the area has been carried out, no unique or unusual wetland cover types were discovered in preliminary surveys.

2.311
The dominant wetland type located in the transmission project area is the wooded wetland. Woody understory and herbaceous plant species associated with wooded wetlands include spicebush, arrow-wood viburnum, red-osier dogwood, cattail, wild grape, bitter nightshade, blackberry, witch hazel, and elder.

2.312
The wildlife species in the project area consist of those species commonly associated with farm woodlots, wetlands, herbaceous communities and woody-shrub communities. These wildlife species include whitetail deer, ruffed grouse, birds of prey, cottontail rabbit, raccoon, wood-chuck, muskrat, and a wide variety of smaller mammals,

reptiles, amphibians, and songbirds. In addition, migratory bird species may be seen in the area seasonally.

2.313
LUNR data show that the dominant wildlife habitats crossed by the proposed right-of-ways are low-growing plant communities. No deer wintering areas are crossed by the proposed facilities.

THREATENED AND ENDANGERED SPECIES

Threatened and Endangered Flora

2.314
Pursuant to the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), on 21 April 1975 the U.S. Fish and Wildlife Service of the U.S. Department of the Interior published a list of four native plants as candidate endangered or threatened species (40 Federal Register 17612). On 1 July 1975, the Service published a further list of over 3,000 plants as candidates endangered or threatened species (40 Federal Register 2782327924). On 16 June 1976, the Service proposed approximately 1,700 plants, most of which are found on the July 1975 list, for endangered status (41 Federal Register 24524-24572). As of April 1977, no final determination had been made for any of the species proposed for threatened or endangered status.

None of the plants on any of the proposed Service lists were observed on the Somerset Site during field surveys specifically designed to determine plant species present.

The 1 July 1975 Federal Register was consulted and none of the threatened or endangered plant species listed in the Register have been found on the proposed transmission line right-of-way. The New York State protected native plant list has also been consulted by the applicant, and although no survey of the proposed corridor has been undertaken for this purpose, it is reasonable to assume that some of the listed plants are contained within the corridor.

2.315
The New York State Department of Environmental Conservation has published in 6 NYCCR 193.3 a list of protected native plants pursuant to Environmental Conservation Law (ECL) 9.1503. The twenty plants which are on the Statewide list of protected plants and which were observed on the Somerset Site are listed in Table 2-33. None of these twenty plants require special consideration because, within the scientific community, they are not considered rare. None of these twenty plants have been proposed by the U.S. Fish and Wildlife Service as candidate threatened or endangered species. ECL 9.1503

TABLE 2-33

PROTECTED NATIVE PLANTS OF NEW YORK STATE OBSERVED ON THE SOMERSET SITE

Common Name	Scientific Name
Lady Fern	*Athyrium filix-femina*
Grape Fern	*Botrychium virginianum*
Rattlesnake Fern	*Botrychium dissectum*
Bittersweet	*Celastrus scandens*
Flowering Dogwood	*Cornus florida*
Shield Fern	*Dryopteris austriaca*
Male Fern	*Dryopteris filix-mas*
Helleborine	*Epipactis helleborine*
Fringed Gentian	*Gentiana crinita*
Winterberry	*Ilex montana*
Cardinal-Flower	*Lobelia cardinalis*
Ostrich Fern	*Matteuccia struthiopteris*
Cinnamon Fern	*Osmunda cinnamomea*
Christmas Fern	*Polystichum acrostichoides*
Rose Pink	*Sabatia angularis*
New York Fern	*Thelypteris noveboracensis*
Marsh Fern	*Thelypteris palustris*
Purple Trillium	*Trillium erectum*
Large-flowered Trillium	*Trillium grandiflorum*
Trillium	*Trillium* spp.

makes it unlawful to pick or damage any of the protected plants without the consent of the landowner. A plant common in one area of the State may require the protection afforded by ECL 9.1503 in other areas. Some species are listed only because of their commercial value.

Threatened and Endangered Fauna

2.316
Pursuant to the Endangered Species Act of 1973 (16 USC. 1531-1543), the U.S. Fish and Wildlife Service has promulgated a regulation listing endangered and threatened wildlife in 50 CFR 17.11. The New York State Department of Environmental Conservation has published in 6 NYCRR 182 a list of endangered wildlife species pursuant to ECL 11.0535. None of the wildlife species on the Federal or State lists permanently inhabit the region of the Somerset Site, nor were any observed on the site during field surveys specifically designed to determine fauna present. The primary effect in the year-long faunal sampling program was to determine the status of threatened and endangered species. Sampling methodology is described in the Article VIII application. The threatened and endangered species whose general distribution includes the area of the Somerset Site are discussed below.

Bald Eagle (Federal-Endangered, State-Endangered)

2.317
A single transient bald eagle was observed perched in the woodland on the eastern edge of the site on 5 April 1974. Migrant bald eagles may hunt along the lakeshore. It is unlikely, however, that the bald eagle would nest on this site due to human disturbance. It was not seen again during the course of the year-long sampling program.

Osprey (State-Endangered)

2.318
The osprey has not been observed on the site or in the area, and is not likely to breed on the site. It could occur as a migrant or may hunt along the lake.

Peregrine Falcon (Federal-Endangered, State-Endangered)

2.319
The peregrine falcon has not been observed on the site or in the vicinity. The peregrine falcon may occur over the site during migration.

Bog Turtle (State-Endangered)

2.320
The bog turtle has not been observed on the site, but it may occur in the region. Suitable wetland areas do not occur on the site, so its presence and breeding there are unlikely.

Blue Pike (Federal-Endangered, State-Endangered)

2.321
The blue pike has been reported from Lake Ontario, although the present distribution is not known. None were collected at the site during sampling, which was specifically designed to determine fish species present.

2.322
Other animal species being studied by the Department of Environmental Conservation for possible inclusion on the list of endangered species include the pine martin, pygmy rattlesnake, yellow-nose vole, and longtail shrew. None of these species have been found on the site. In addition, the Chittenango ovate amber snail and the Karner blue butterfly, which were recently added to the list of endangered species, have not been found on the site.

2.323
Federal and State lists of threatened or endangered fauna have been reviewed, and no such species permanently inhabit the area along the proposed transmission line right-of-way. During migration, however, several endangered bird species including the bald eagle, osprey, and peregrine falcon may be seen in the transmission project area.

National Audubon Society Blue List

2.324
Suitable habitat for many of the Blue List Species is present on the site, and the marsh hawk, American kestrel, yellow-billed cuckoo, barn owl, yellow warbler, common yellowthroat, Henslow's sparrow, and grasshopper sparrow probably breed there (Table 2-31).

At least one pair of marsh hawks was observed frequently on the site and is believed to have nested. American kestrels were frequently observed and a viable nest was found near the eastern edge of the site. Several other pairs were presumed to breed in the ecotones and deserted orchard. Two barn owls were found occupying a barn east of Hosmer Road, while grasshopper sparrows were observed nesting in open fields on the site. In addition, yellow-billed cuckoos are assumed to nest in woodlands associated with the site. Henslow's sparrow was observed breading on the site in the summer of 1975.

State Management Plan

2.325
The Department of Environmental Conservation has not prepared a management plan for endangered or threatened plant or animal species in the State. The DEC is currently preparing a plan to recover certain endangered species which will eventually result in a management plan to increase their populations and assure their protection. Most of the planning activity has been centered on the bald eagle and the osprey.

Unique Habitat

2.326
The applicant has surveyed the transmission line area by air and on foot to satisfy Article VII requirements. No portion of the site provides the unique habitat required by any of the above-listed endangered species. No aquatic or terrestrial habitat on the site or in the immediate vicinity is unique or unusual on a State, regional, or local basis. There are no wetlands on the site.

2.327
No unique or unusual wildlife habitats in the transmission line area were found during the applicant's studies. Freshwater marshes and wet meadows could be crossed by the proposed facilities. The wet meadow areas may satisfy the habitat requirements of the bog turtle, a classified endangered species in New York State. No bog turtles have been observed in the project area. In view of the fact that these wetland habitats are commonly found within the Erie-Ontario Lowland Region of New York State, they are not considered unique or unusual within the transmission project area. The actual transmission line corridor will be selected and certified by the State of New York, at a later date, in accordance with Article VII of the Public Service Law.

CHAPTER 3 - RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

Local Zoning

3.001
A copy of the applicable zoning map for the area within one mile of the proposed site boundary is presented in Chapter 2, Figure 2-1. Although a portion of land in the middle of the site is zoned industrial and the shoreline area is zoned residential, the primary zoning for the site is agricultural. Construction and operation of the proposed station would preempt all residential and agricultural uses.

Local and Regional Land Use Plans

3.002
According to "Land Use Concept Map," Atlas of Regional Plans and Programs, Erie and Niagara Counties Regional Planning Board, November 1973, the site falls within an area classified primarily as a "growth potential area." A corridor of residential development is projected along the shoreline of Lake Ontario; some commercial development may also be in conjunction with the residential development. This corridor passes through the Somerset site and is bounded on the south by an east-west transportation corridor (Lake Ontario State Parkway). An open space corridor passes through the southeastern corner of the site.

3.003
The proposed station will interrupt the residential/commercial corridor projected along Lake Ontario since the site area will preempt all residential and commercial uses.

3.004
There is also a potential conflict with the proposed Lake Ontario State Parkway since the present alignment of the parkway goes through the site. However, no final alignment has been established; consequently, the proposed parkway could be routed around the station. The above-mentioned residential/commercial growth corridor will follow the realigned parkway.

3.005
The Erie and Niagara Counties Regional Planning Board adopted the "Adopted Regional Recreation and Open Space Plan" in November 1971 and was last amended on 14 November 1974. It identifies Potter Road Park as a 30-acre park, to be developed during the 1973-80 time period. The area designated for the park is located along the Lake Ontario shore within the Somerset Plant Site on property owned by NYSE&G. This portion of the site is devoted to solid waste disposal. Present plans are to locate the solid waste disposal area 1,000 feet

from the shore with a buffer zone created between the shore and the disposal area.

NYSE&G would be willing to work with the town of Somerset in the development of a park in this area of the site at the conclusion of its use as a disposal area. This is expected approximately 10 years after the start of the plant operation, i.e., 1993.

Contours of the solid waste disposal area can be altered to suit the development of the park. The stabilized sludge which will be disposed of in this area will be able to accommodate light loads.

3.006
This plan also indicates a planned recreation/open space area along Fish Creek which meets Lake Ontario approximately two miles east of the plant site boundary. As currently configured, the contemplated recreation/open space area would follow Fish Creek and cross the southeast corner of the plant site boundary, passing within approximately 0.75 miles of the fossil plant at its nearest point.

3.007
The "Recreation and Open Space Map," Atlas of Regional Plans and Programs, Erie and Niagara Counties Regional Planning Board, November 1973, projects alignment of the Lake Ontario State Parkway through the proposed site. (Refer to the first plan discussed above for the station's impact on this parkway.)

State Land Use Plans

3.008
The New York State Parks and Recreation Office Plan, People--Resources-Recreation: New York Statewide Comprehensive Recreation Plan, September 1972, identifies potential land use in the area. The site area along the lake is included in a lakeshore corridor that is identified as a "potential recreationway." Although this corridor will be interrupted by the proposed station, and some of the corridor's use will be totally preempted by station construction and operation, development of the corridor may not be totally precluded. The applicant is receptive to possible multiple use of the site, especially as it relates to recreation.

Other State plans that may be applicable are the New York State Development Plan (1971) and the New York Statewide Master Plan for Transportation (1973). The present and planned future existence of a State Agricultural District surrounding the site may be regarded as a type of land use plan since it designates land use and influences tax structures. This district is shown in Figure 2-2. This agricultural

district influenced the decision to use onsite rather than offsite disposal of solid waste.

Regulatory Jurisdiction

3.009
Direct regulatory authority over the development of the project site would be administered by the town of Somerset Planning Board. No land use plans have been developed by this Board.

Transmission Lines

3.010
If the proposed transmission system utilizes existing right-of-way, no conflict with land use plans for areas adjacent to the right-of-way is expected. However, a final route has not yet been selected from the four or more alternatives.

3.011
Study of available development proposals and plans indicates that a linear town park is proposed south of Barker, approximately two miles east of the right-of-way. Linear parks are also proposed along the New York State Barge Canal and along Eighteen Mile Creek, east of Royalton Ravine Park. Numerous open space corridors or conservation strips are also proposed along several streams; however, the major areas lie east of the right-of-way. The applicant finds no conflict between the proposed installation and any established land-use plan.

3.012
Examination of zoning ordinances for the towns along the proposed right-of-way indicate rural residential and agricultural uses for the areas traversed by the proposed route. Agricultural districts are shown in Figure 2-2.

3.013
Federal, State, and local agencies responsible for land use planning were contacted in writing by the U.S. Army Engineer District, Buffalo, to determine the relationship of the proposed action to land use plans or proposals. The agencies that were contacted are listed in Chapter 9 of this impact statement. None of the contacted agencies submitted adverse responses concerning the proposed plant, although some reserved judgment until they have had a chance to review the EIS. These land use planning agencies will be asked to comment on the Environmental Impact Statement.

CHAPTER 4 - THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

INTRODUCTION

4.001
This chapter addresses the associated impacts which are inherent in the construction, operation, and maintenance of the proposed Cayuga Station at Somerset. The action with which this EIS is concerned is the application by the New York State Electric & Gas Corporation for a Department of the Army permit to dredge in Lake Ontario and to construct a submerged discharge structure, an intake structure, and associated pipelines. The potential direct environmental impacts associated with authorizing these structures and the dredging will be borne largely by the receiving waters and their biota. Indirect impacts of authorizing the construction would result from operation of the generating station and would include effects on air quality, ambient noise levels, aesthetics, sociological conditions, water quality, economics, and others. To describe fully the total array of potential environmental effects, this section details the impacts of construction, operation, and maintenance of the entire facility.

ENVIRONMENTAL IMPACT OF POWER PLANT CONSTRUCTION

LAND USE

4.002
Except where permanent plant facilities are to occupy the land, all areas to be disturbed for construction purposes will be planted with trees and grass or landscaped. Table 4-1 indicates the acreage to be cleared and replanted. Table 4-2 indicates the extent of acreage to be cleared for construction facilities and permanent facility structures. The total area of 171 acres to be cleared (17.8 percent of the site area) includes five acres of beech-maple forest (seven percent of the cover type on the site), 1.5 acres (4.6 percent of the cover type) of deserted orchard, 49.5 acres (16.7 percent of the cover type) of open field (which includes eight acres in the transmission corridor), 104 acres (20 percent of the cover type) of farmland, 6.8 acres of orchards (for rail access through the transmission corridor), and four acres (53 percent of the cover type) of fencerow.

TABLE 4-1

ESTIMATE OF ACREAGE TO BE RESTORED
AT THE SOMERSET SITE

Description	Total Acres
Cleared areas for facility, roads and site structures will be replanted as follow:	
A. Wooded areas	8.0
B. Grassed areas - Adjacent to railroad, roads, and transmission lines	50.0
Construction facilities only	42.0
C. Landscaping around plant	6.0
TOTAL	106.0
Cleared areas occupied by plant and facilities	65.0
TOTAL	171.0
Areas not to be cleared, but to undergo landscaping changes:	
A. Wooded areas planted over open field	98.7
B. Wooded areas planted on farm land	24.3
C. Abandoned orchard to be converted to wooded areas	12.3
D. Abandoned orchard to be planted with mixed shrubs	18.2
E. Open fields to be planted with mixed shrubs	15.0
F. Active farm land to be planted with mixed shrubs	7.0
TOTAL	175.5

TABLE 4-2

ESTIMATE OF ACREAGE TO UNDERGO CHANGES
AT THE SOMERSET SITE

Description		Total Acres
Total acreage to be cleared for facility (includes intake pump house, main plant buildings, transformer area, precipitator area, FGD area, and chimney).		22.0
Total acreage to be cleared for access roads.		9.0
Total acreage to be cleared for site structures:		
A. Switchyard	4.0	
B. Coal handling, storage and equipment	25.0	
C. Railroad tracks*	41.0	
D. Bridge	1.0	
E. Yard tanks	1.0	
F. Waste treatment areas	2.5	
G. Permanent parking areas	2.0	
H. Transmission lines, transformer area to switchyard only	3.0	
I. Warehouse	1.0	
J. Construction facilities	54.5	
K. Limestone Handling and Storage	5.0	
SUBTOTAL		140.0
TOTAL acreage to be cleared		171.0

*Includes 15 acres south of Lake Road for rail access in transmission corridor.

4.003
Changes in acreage of land classification units are presented in the table below. Since the Somerset site does not contain any lowland areas, the table reflects only upland areas.

LAND USE AND GENERAL COVER TYPES BEFORE CONSTRUCTION AND AFTER SITE RESTORATION ON THE SOMERSET SITE

Land Use	Before Construction[a]		After Site Restoration	
	Area (Acres)	Percent of Total Area	Area (Acres)	Percent of Total Area
Residential	30	3	0	0
Commercial and Industrial	1	1	50	5
Active agricultural land:				
Annual cropland	472	49	0-435[b]	0-45
Hay and pasture	67	7	0-435	0-45
Active Agr. Land Total	539	56	0-435[b]	0-45
Natural vegetation and inactive agr. land				
Open field	245	25	190-625[c]	0-66
Deserted orchard	32	3	0	0
Fencerow	8	1	4	1
Shrub community	0	0	46	5
Woodland	60	6	199	21
Lakeshore	5	1	5	1
Stream border				
Woodland	35	4	35	4
Shrub	7	1	7	1
Natural Vegetation & Inactive Agr. Land Total	392	41	486-921	51-95
Ponds	1	1	1	1
TOTAL LAND USE	963	100	966	100

a. Based on 1975 cover values.
b. Agricultural land will be available for leasing; thus, the area is expressed as a range.
c. Areas not leased will be allowed to revert to natural cover types.

VEGETATION

4.004
The major impacts associated with the construction activities will be in the loss of vegetation and wildlife habitat in these disturbed areas. Within the site boundaries, the facility will require 50 acres of land to be permanently cleared and an additional 106 acres of land to be cleared for use during construction. The area to be permanently cleared includes approximately five acres of woodland, less than two acres of deserted orchard, four acres of fencerow, 18 acres of open field, and 21 acres of active agricultural land. Temporary construction areas will require the clearing of about 24 acres of open field and 82 acres of active agricultural land. All temporary construction will be included in the site restoration plans, as will other portions of the site where visual screening, noise screening, or erosion control are required.

The plant species and cover types to be disturbed or removed are common to the Somerset site region. No endangered or threatened plant species will be affected and no species or population is expected to be endangered. In order to protect and preserve, if at all possible, the pond and associated woodlands in the northeast corner of the site, the applicant will pile solid waste to a height of 70 to 80 feet in order to reduce the acreage needed for solid waste disposal.

SOILS

4.005
Concomitant to the loss of vegetation, construction activities could result in increased leaching and runoff from the exposed soil. Topsoil and subsoil parameters could conceivably change as a result of those activities. Topsoil will be stored during the construction period and replaced during revegetation. Construction will also result in soil compaction, which renders it less suitable for revegetation. Clearing of vegetation will interrupt nutrient cycles and eliminate soil fauna, possibly destabilizing the biogeochemical components of the soil system. Improper storage of topsoil can result in water and wind erosion, fugitive dust, and leaching of soil constituents.

4.006
An erosion control program has been designed to provide runoff control, sediment trapping, and soils stabilization using revegetation, protective blankets of rock, gravel, and/or netting. Storm water runoff from construction laydown, spoil, and batch plant areas will flow through a network of diversion ditches and culverts to settling basins within the construction area.

During construction, nonvegetative measures will be undertaken to minimize erosion during temporary surface disturbances. All proposed slopes (cut or fill areas) will be graded and stabilized by revegetation, contour stripping, or protective rock blankets. In areas where new construction is involved and existing topography precludes the formation of settling basins, silting fences will be provided for temporary use in controlling erosion and preventing suspended solids conveyance to water surfaces.

WILDLIFE RESOURCES

4.007
The primary adverse effects of construction on the natural animal populations at the Somerset site will result from loss of shrub and woodland habitat and disturbance associated with the operation of equipment and blasting activities. Wildlife associated with deserted orchard and woodland cover types on the site include song birds (e.g., black-capped chickadee, eastern wood pewee, red-eyed vireo, wood thrush, starling, and downy woodpecker), raptors (e.g., red-tailed hawk and great horned owl), ring-necked pheasant, American woodcock small mammals (e.g., white-footed mouse and short-tailed shrew), eastern cottontail, gray squirrel, fox, raccoon, and white-tailed deer. These species will lose approximately 11 acres of vegetative cover. Wildlife on the site associated with the early and late stage open field cover types include song birds (e.g., savannah sparrow, song sparrow, and red-winged blackbird), raptors (e.g., marsh hawk, barn owl, and sparrow hawk), meadow vole, eastern cottontail, and fox. These species will lose approximately 40 acres of habitat. Most of these species (except the small mammals) will be capable of avoiding immediate destruction by leaving the area, but some of the displaced animals may not be able to establish territories and/or feeding areas nearby. The loss of wildlife including those of recreational value and wildlife habitat will not be significant on a regional basis, and for most species the loss would be difficult to measure. As there are no endangered or threatened animal species on the site, there will be no impact on such species due to land clearing activities. There are, however, species on the Audubon Blue List that nest on the site. These species include the marsh hawk, American kestrel, yellow-billed cuckoo, barn owl, and grasshopper sparrow. Site habitat for those species may be threatened or destroyed by construction activities. No wetlands are expected to be impacted.

4.008
Construction activities will reduce the abundance of small mammals, which in turn could affect populations of predators utilizing them for food. Construction activities and increased traffic will probably increase the number of mammal road kills at the site.

4.009
The wildlife utilizing the site will have to modify travel lanes and passage routes to avoid the areas actively disturbed by construction and to find replacement habitat for components lost to clearing. Species affected by construction include those such as deer, fox, and raccoon, which generally have large home ranges to satisfy all their habitat requirements (i.e., food, cover, and water). These species (or their sign) have been observed traversing the site to and from the east, west, and south. The construction area and associated fences will restrict movement across 331 acres between Lake Road and Lake Ontario. Some animals may jump (e.g., deer), climb over (e.g., raccoon), or burrow or crawl under (e.g., fox and raccoon) the fence which will be a seven to eight foot high cyclone fence. Others will pass around the south side of the fenced area, but because this will require the crossing of Lake Road, some animals will probably restrict or alter their east-west travel. No endangered or threatened animal species will be affected by fencing.

4.010
Sedentary organisms such as moles, salamanders, and nestling birds will be unable to escape and will perish as a result of construction activities. Noise associated with construction of the facility constitutes a potential impact on wildlife. Construction noise at the Somerset site will consist of steady and intrusive sounds occurring primarily during daylight hours. The maximum noise values estimated at the site boundary nearest construction activity would be intermittent. Noise levels will be somewhat higher at various places within the site boundaries. Topography and vegetative cover affect sound wave transmission and will moderate noise levels somewhat. Construction noise may affect wildlife on the construction site proper to some extent, but methods for quantifying adverse effects have not been developed. The most likely effects will include aversive behavior (e.g., some animals will probably move to areas with lower sound levels) and masking of auditory signals of species that remain in areas having higher noise levels. Noise may affect breeding, nesting, and feeding activities.

Several wildlife species which are relatively common on the Somerset site (e.g., Canada goose, ring-necked pheasant, and eastern cottontail) are able to survive and prosper near human activity centers. These species survive adjacent to highways, airports, and industrial facilities (such as operating power plants) when suitable habitat is available.

AIR QUALITY

4.011
During construction activity, exposed soil surfaces will be a source of fugitive dust. Construction plans call for roads used during

construction to be surfaced with asphalt-penetrated crushed stone. In general, areas disturbed by construction will be protected by non-vegetative or vegetative cover, grading, and contour stripping. Chippings from unwanted vegetation will also be used as part of the erosion control program and in landscape treatment. Water spraying will be used to control dust during dry periods. Permanent vegetative erosion control on the site will be accomplished by the use of hardy perennial grasses, legumes, and woody plants.

4.012
Any fugitive dust impact will depend on type of construction activity, the soil moisture content, snow cover, and the surface wind characteristics. Because these conditions are highly variable, it is not possible to meaningfully estimate concentrations of total suspended particulates (TSP) or settleable particulates by modeling techniques. Fugitive dust impacts will be most pronounced on the site. During high wind conditions with very dry exposed soil surfaces, generation of fugitive dust can be significant. The impact of construction-related fugitive dust will increase in significance if agricultural activities in the area such as plowing occur concurrently.

4.013
Present facility construction plans call for the operation of an onsite concrete batch plant. Operation of this plant will result in emissions of particulates through various vents. A simple "worst-case" analysis indicated that a maximum 24-hour average TSP concentration of 28 ug/m^3 might be expected at the site boundary due to the batch plant emissions.

4.014
Other construction activities which will influence ambient air quality are open burning (if allowed) and the operation of various types of construction equipment such as auxiliary diesel engines, trucks, transporters, bulldozers, etc. Open burning will result in the release of a variety of air contaminants; smoke opacity depends upon the type and quantity of materials being burned. Emissions from construction equipment will include carbon monoxide, hydrocarbons, and oxides of nitrogen. It is expected that there will be insufficient emissions to cause significant air quality deterioration. The effect of open burning construction equipment emissions will be largely confined to the site, will be of short duration, and will be regulated by the State of New York. Exhaust emissions from diesel-powered construction vehicles must not exceed Ringelmann No. 1 or an equivalent standard and diesel engines shall not idle for more than five consecutive minutes when the vehicle is not in motion.

4.015
In general, areas disturbed by construction activities will be protected by both vegetative and nonvegetative methods to minimize the potential generation of dust. Where such measures are not immediately viable, dust will be controlled during dry periods by water spraying.

WATER USE AND WATER QUALITY

4.016
During construction lubricants, oil, and chemicals will be stored in designated storage areas, which will be designed to contain and hold any potential spills until manual removal can be effected. This should minimize the possibility of contaminated runoff reaching Lake Ontario and onsite waters. Trash, including chemical wastes and oil, will be removed from the site, and disposed of in a State-approved landfill. This should alleviate the generation of contaminated leachates which could affect the water quality of Lake Ontario and onsite waters.

4.017
Construction of the storm drainage system will entail clearing the affected areas of vegetation, and excavation for the proposed channels or pipelines. Possible impacts would be those associated with erosion and sedimentation caused by runoff during construction of this system. This activity, however, will be included in the erosion control plan for the site, and, as such, will not affect any water resources within or adjacent to the site.

4.018
Holding ponds (settling basins) will be constructed as part of the erosion control plan designed for the Somerset site. These ponds will retain runoff from areas disturbed by construction and settle out suspended solids contained in the runoff.

4.019
The construction of the sedimentation basins will entail clearing the affected areas of vegetation, and excavation for the basins. Possible erosion and siltation impacts associated with this activity will be minimized by the erosion control plan for the site. The operation of these basins will result in the effluent being discharged into Lake Ontario. The requirements of the EPA Effluent Guidelines and Standards (40 CFR 423) will be met.

4.020
The installation of a temporary water intake structure for construction requirements will have a transitory effect on Lake Ontario in

the immediate vicinity of this activity. Construction water requirements are relatively small; consequently, the temporary intake structure will be small. Local turbidity will be increased temporarily during installation of this system, but will cease during operation. Consumptive use of Lake Ontario water will be negligible. Estimated demand for potable and construction-use water during the construction phase is as follows:

April-December 1979	-	10,300 gal/day
January-December 1980	-	16,800 gal/day
January-December 1981	-	26,500 gal/day
January-December 1982	-	28,800 gal/day
January-September 1983	-	12,200 gal/day

4.021
Excavation and land clearing will affect drainage patterns and natural runoff in the disturbed areas. However, this disruption will be mitigated by the fact that these activities will be confined to areas protected by the construction runoff control system, thereby minimizing potential impacts associated with erosion of unprotected soil. Implementation of this program will ensure that siltation of watercourses or waterbodies within or adjacent to the site, due to construction-related activities, will be minimized.

4.022
Solid waste disposal areas will be designed such that contamination of groundwater resources should not occur. Permanent runoff from these areas will be treated prior to discharge so that this activity will not adversely affect surface water resources. Areas affected by the construction of solid waste disposal facilities will be provided with a runoff control system to minimize potential erosion impacts.

4.023
Chemical and sanitary wastes will be treated prior to discharge to meet all applicable regulations. Consequently, this activity will have minimal adverse impact on site water resources.

4.024
Dredging of the lake bottom during installation of the intake and the discharge structures will mostly affect benthic organisms. These organisms will be impacted by dredging and blasting associated with this construction activity. The area affected is 8,773 square meters (94,000 square feet). A total of 7,000 cubic yards of sediment and 21,000 cubic yards of rock will be removed. Dredging and blasting will cause an increase in turbidity in the immediate area of the activity. Dissolved and particulate nutrients will be released from the sediment during dredging and blasting and enter the water column. Physical disruption of the sediment will also temporarily increase

the levels of solids and chemicals in the lake water affecting water quality.

4.025
Sediment samples were collected at the 50-foot depth in the vicinity of the planned intake structure. Samples could not be obtained from the 10-foot and 30-foot depths because of the layer of rocks covering the bottom. Samples obtained at the 50-foot depth indicated that the sediment is moderately to heavily polluted with lead, zinc, and copper. Mercury, oil and grease, and polychlorinated biphenyls (PCB's) were found in smaller amounts, although in one sample the mercury level (0.93 mg/kg) approached the rigid 1 mg/kg limitation established by the EPA. Table 4-3 presents the sediment analysis and EPA classification of pollution levels as described in EPA Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments. Resuspension of sediments containing the above pollutants during construction operations could have possible adverse effects on lake biota and water quality in the area.

4.026
Dredged material will be disposed of in a specially delineated spoil area on the site to be utilized in plant construction. The spoil area will be provided with an earthen dike and a settling pond.

4.027
Site preparation and construction of the proposed station will have minimal impacts in use of local and regional water resources. No freshwater wetlands exist within the site, nor will the proposed station impact those in other parts of the region. Runoff from the upland area of the site and the surrounding area will continue to flow into Lake Ontario, although some diversions and erosion control features will be encountered. It will be necessary to culvert two small streams that cross under the railroad. This activity will temporarily disrupt their flows.

4.028
There should be minimal impact on groundwater resources at the Somerset site, since groundwater will not be used as a water source. Measures will be taken during construction and operation to ensure that there will be no contamination of the groundwater due to leaching or accidental spills. It may be necessary to lower the groundwater table for construction of the main building foundations or the coal and limestone and stabilized FGD sludge storage areas. It is expected that the effects on ground water levels in the area will be minimal, although the extent of dewatering cannot be predicted at this time. Since saline water encountered in test wells on the site was located at depths of more than 200 feet, it is highly unlikely that saline water will be induced upward by any activity at Somerset.

TABLE 4-3

SEDIMENT ANALYSIS (in mg/kg dry weight)

Transect	Water Depth (feet)	Sediment Depth (inches)	pb	Zn	Cu	Hg	Oil & Grease	Polychlorinated Biphenyls (PCB's)
5	50	0 - 3	55.0	162.0	31.1	0.47	891.3	*0.380 (Aroclor 1242)
		6 - 9	54.6	101.0	34.4	0.23		
		15 - 18	36.0	70.8	19.9	0.23		
9	50	0 - 3	76.4	211.0	53.6	0.93	919.6	*0.290 (Aroclor 1242)
EPA Guidelines		Non-polluted	40	90	25	1	1000	1
		Moderately polluted	40-60	90-200	25-50	-1	1000-2000	1 - 10
		Heavily polluted	60	200	50	1	2000	10

* Only Aroclor isomer detected.

Because of the known bioaccumulation of mercury and PCB's, a rigid limitation is used. If guideline values are exceeded, the sediments are classified as polluted no matter what the other data indicate. The pollutional classification of sediments with total PCB concentrations between 1.0 mg/kg and 10.0 mg/kg dry weight will be determined on a case-by-case basis.

4.029
Construction equipment in the lake will temporarily affect use of a localized area for recreational boating, water skiing, and fishing. No impacts on commercial navigation are expected to occur as navigation channels are well offshore. The area near the site is not generally used for swimming and thus no impacts on this activity are expected as a result of construction. There are no known raw water intake structures in the near-site waters of Lake Ontario that would be affected by dredging or construction of the intake and discharge structures.

AQUATIC ECOLOGY

4.030
Construction activities which can potentially have an impact on the aquatic ecology of the Somerset site include physical disruption of lake sediment and alteration of aquatic habitat in Lake Ontario. In addition, construction runoff and underwater blasting activities could affect fish, benthic organisms, and plankton communities. Construction activities include the placement of 30,000 cubic yards of fill material in Lake Ontario for the intake and discharge structures. This activity is regulated by Section 404 of the Federal Water Pollution Control Act of 1972 and requires a Corps permit. Specific impacts of this activity are discused in Appendix D.

4.031
During dredging and blasting, dissolved and particulate nutrients will be released and decomposer activity may be accelerated. Zooplankton production may be temporarily increased due to detrital feeding. Phytoplankton productivity could increase as a result of nutrient release. No significant impacts are projected beyond the immediate, short-term impacts. Physical disruption of bottom sediments during construction of the proposed facility will temporarily increase levels of solids and chemicals at the construction site and consequently affect the aquatic biota of Lake Ontario. High levels of suspended solids are damaging to fish, fish eggs, benthic invertebrates and plankton. Levels of suspended solids known to be deleterious to aquatic animals span a wide range, which is related to the variations in ambient conditions and physiological state of the organisms (age, life stage, season, etc.) Release of potentially toxic chemicals can occur because of sediment disturbance. Metals, oil, grease and other toxic chemicals present in typical lake sediments can be damaging to aquatic organisms at high concentrations or long exposure times.

4.032
The loss of benthic invertebrates for the areas to be excavated for intake and discharge is estimated to be approximately 9.56×10^5 in

proximity to the 10-foot depth contour and 4.37×10^6 in proximity to the 30-foot depth contour. After construction is complete, recolonization of the excavated areas by similar species should occur, assuming newly exposed surfaces will be similar to existing bottom surfaces.

4.033
Excavation of bedrock will require underwater blasting. A one-time loss of aquatic organisms in the immediate vicinity of the blasting will occur. This loss will be minimized as much as possible by the use of advanced blasting techniques, and deployment of fish barriers (net curtains) around the blast site. It is not anticipated that the impact of blasting will have any significant or lasting effects on the aquatic ecosystem. A typical blasting schedule would be a charge of 1,200 to 2,000 pounds of explosive (typically Gelamite D) detonated once a day. Using the most destructive damage criteria (based on lowest pressure harmful to fish), a blasting detonation would have a damage area for fish of 1.1 to 1.3 acres. To prevent damage to fish from the underwater blasting, the applicant will either net off the impact area or dispel the fish from the area prior to detonation. The methodology involved as well as the necessity for netting or dispelling fish from the blasting area is not fully developed at this time. Strategies will be discussed in detail with representatives of New York State PSC and DEC and will be made a part of the compliance filing under NYS Article VIII procedures. One possible methodology would involve netting off the blast area from the surrounding lake waters. Essentially it is envisioned that a large curtain or seine type net will be deployed by towing the net offshore while the ends are held in place at two locations onshore. This net would be deep enough to curtain off the blast area out to beyond the 15-foot depth (a total net length of about 2,500 to 3,000 feet would be required). A mesh size of approximately one inch will probably be used since this will exclude most larger fish and will present a small cross-sectional drag such that lake currents would not collapse the net. A heavily weighted mud line - lead line will hold the net on the bottom. The weighting could be reinforced with large concrete anchors deployed and attached to the net bottom after the net is in place. Large floats could be placed on the float line if the apparatus tends to lay over in the current.

4.034
Due to possible adverse effects on fish populations, no dredging or blasting will take place in waters having a depth of 10 feet or less from 15 June through 15 August. This will reduce impacts to fish in the nearshore zone during the spawning season and during periods of high fish concentration in this region.

AGRICULTURAL PRODUCTIVITY

4.035
During 1975, crop production on the site consisted of 220 acres of corn, 85 acres of oats, 25 acres of cabbage, 20 acres of wheat, and 20 acres of buckwheat. The total agricultural value of this site is a gross of approximately $157,000. During 1975, 539 acres of land were in an active agricultural land status (472 acres cropland and 67 acres hay and pasture). The 1975 average represents a large increase in onsite agricultural activity over the 375 acres devoted to agriculture in 1974.

4.036
After site restoration, which includes extensive planting of trees, shrubs, and grasses, the range of land which could be used as active agricultural land (annual corpland or hay and pasture) is from zero to 435 acres, depending on lease arrangements. If no land is leased, the annual potential monetary loss could equal or exceed the 1975 value of $157,000, depending on crops planted and market conditions. On the other hand, if all 435 acres are planted, there would be a net loss of approximately 100 acres or a one-fifth reduction of the 1975 value of $157,000, again depending on crop and market conditions (equalling a $31,000 potential loss per year). The loss in terms of 1982 dollars would probably be higher, as these figures are based on 1975 dollars. Since 910 acres of the site are classified as prime farmland and 0-435 acres would eventually be available for active agriculture, the amount of prime farmland affected by the project would vary from 475 to 910 acres. It should be pointed out that only 59 percent of the onsite land classified as prime farmland was actually used as active agricultural land in 1975. The county aggregate acreage for these prime farmland soils is in excess of 58,000 acres. A maximum of 1.5 percent of this total acreage will be removed from potential agricultural use.

4.037
Construction activities will preempt approximately 104 acres of annual cropland during the four growing seasons where the plant is under construction (March 1979 to June 1982). Temporary construction areas will preempt 82 acres of active agricultural land. Twenty-two acres of active agricultural land will be permanently cleared for the station. Since restoration plans include the planting of trees, shrubs, and grasses, the temporary reduction of 82 acres could actually be a permanent removal, depending on the lease arrangements and restoration. Based on a potential permanent reduction of 104 acres, the annual monetary loss would be roughly equal to the $31,000 indicated above (1975 dollars).

AESTHETICS

Visual

4.038
The large scale of the proposed station will create a marked visual impact on the adjacent land areas. During the construction phase, visual impacts will be associated with the physical disruption of the station site.

Generally, the visual impact of the station will be proportional to the distance from a given vantage point. The intensity of this impact may be neutralized or modified by existing natural elements (i.e., topography, vegetation, climate, etc.) and/or man-made structures (i.e., buildings, walls, fences, etc.). Unobstructed or unmodified vistas or views that are obscured by man-made or natural elements will modify or neutralize the visual impact of these facilities, depending on distance, line-of-sight conditions, and the size of the modifying elements in relation to the observer.

4.039
The areas most affected during months of foliage will be the residential areas and recreational facilities close to the Somerset site, i.e., the cottages adjacent to the boundary along Lake Ontario and Camp Kenan (the YMCA summer camp). Krull Park and Golden Hill State Park will be less affected. The station will not be recognizable from Krull Park near Lake Ontario or from Golden Hill State Park. Although the visual impact of the station will be increased during the defoliate months, Camp Kenan, which operates only during July through mid-August, will not realize this impact. The greatest potential visual impact will be on those who will view the station from Lake Ontario, since most of the site will be visible from the lake.

Plans to minimize the impact of the station include planting a 400-foot wide buffer zone of deciduous and coniferous trees along the southern property line adjacent to Lake Road. The buffer planting screen will be compatible and consistent with existing vegetation and, on maturation, will provide an effective visual screen. A mixed hardwood forest to the east of the station will be retained. A cut will be made through the mixed hardwood forest just west of the station for the transmission line.

4.040
During construction, an attempt will be made not to disturb the existing healthy vegetation. Where vegetative clearing is necessary, trees (if suitable) will be removed and used for onsite mulching, and stumps will be removed from the site for disposal as directed by

local regulations. Topsoil will be stripped from the area of construction and stockpiled in selected locations, with slopes controlled to minimize erosion. Swales will be established to control rain-scoured materials and runoff until grasses are established. Approximately 288 acres will be restored on completion of the project by additional planting of indigenous vegetation species.

4.041
In addition to the undisturbed vegetation, a new planting area will be established along the shoreline to diminish the visibility of the massive station structures from the lake. A new planting area will also be established adjacent to Lake Road at the southern boundary of the site to serve as a visual and auditory barrier from the road.

4.042
The effectiveness of the vegetative screen as a visual and auditory barrier will not be fully realized until the planted trees have attained maturity. The screen will be most effective during the months when the trees are in foliage. Due to the relative flatness of the land area surrounding the lake, topography is not considered to be a major contribution for effective visual screening. Ground-and-middle-story planting will also be accomplished to maintain and establish soil stability in the disturbed areas.

Noise

4.043
Up to a distance of 8,000 feet from the site center in the winter and up to a distance of 4,000 feet in the summer, defined noise impacts (16 NYCRR Part 75) will occur. No residences will be in the defined impact area during the summer. Approximately 10 residences (34 people based on an average of 3.4 occupants per household in this area) will have a defined impact during the winter, but the L50 noise level will be between 40 and 45 dBA. These levels are below standards proposed by the DEC (45 dBA nighttime and 65 dBA daytime for residential areas).

The normal construction workday will be from 8:00 a.m. to 4:30 p.m. Monday through Friday, so the truck traffic to and from the site will be moving between those hours.

4.044
It is expected that at the site entrance roadway, the construction traffic would typically exceed the ambient noise level less than 25 percent of the time. In comparison to the existing traffic flow along Route 18 (1,600 vehicles per day (1975 DOT data), it is not anticipated that this increase in the noise levels experienced in the

site environs would cause any annoyance due to the small incremental increase in traffic flow. Similarly, the construction workers commuting to and from the site will affect the ambient noise levels for short periods before and after the work day. However, due to existing traffic, the overall daily increase in the noise levels is not expected to be an annoyance.

HISTORICAL, CULTURAL AND ARCHEOLOGICAL RESOURCES

4.045
Of the 12 sites which are of potential historic or cultural interest in the area of the Somerset site (see Chapter 2, "Cultural Resources"), three would be impacted by site preparation and construction. Only two of the three sites, the Van Wagoner House and Pettit Farm, are potentially eligible for inclusion in the National Register. For each property determined eligible (see Appendix E) the District Engineer will consult with the State Historic Preservation Official to review the effect that the applicant's proposal will have on the resource. (See Historical and Cultural Resources under Environmental Impact of Plant Operation.) Upon ascertaining the effects, the District Engineer will proceed with the prescibed consultation procedures pursuant to 36 CFR 800.5 (Advisory Council on Historic Preservation Procedures for the Protection of Historic and Cultural Properties). Corps compliance with these regulations and procedures will insure that necessary safeguards are implemented to protect the properties from significant adverse effects.

4.046
The Van Wagoner house, a county historical landmark which may meet National Register criteria, is located on the construction access road near the area proposed for the station's coal pile.

4.047
The Frost Homestead and the Pettit Farm are both in the area of the proposed railroad right-of-way. Although the Frost Homestead has already been razed, the railroad spur construction could do further damage to the remaining foundations. Some buildings on the Pettit Farm have previously been demolished, and railroad construction could further alter the remaining foundations. In addition, the remaining buildings might have to be razed.

4.048
The applicant will consult with appropriate agencies regarding practical means of preserving any archaeological artifacts found on the Somerset site during the construction of the proposed facility. If practical, considering costs of delay or relocation and the relative importance of the items found, the area in which the artifacts were

discovered will be preserved for further exploration. However, due to the results of the onsite inspection and the background and literature search (see Chapter 2, "Cultural Resources"), the probability of finding additional archaeological resources is low.

SOCIAL AND ECONOMIC IMPACTS

Businesses and Homes Displaced

4.049
Approximately 16 houses with about 30 occupants would be displaced by the construction of the proposed facility at the Somerset site. The occupants will relocate in accordance with their own preferences and means. There are no commercial businesses on the site.

Traffic Patterns

4.050
The analysis of the highway network's ability to accommodate the influx of vehicular traffic due to construction of the station concentrates on key intersections. Key intersections are those intersections where the traffic bound to and from the station site could increase to such an extent that the theoretical capacity of these intersections could be approached or surpassed, therefore deteriorating traffic flow and safety.

4.051
Four intersections that could have theoretical capacities surpassed and, therefore, constrain the flow of traffic are: State Route 18 and Hess Road; State Route 18 and Hosmer Road; State Route 18 and Quaker Road; and Quaker Road and Main Street. The maximum impact of construction-generated traffic will be felt during the peak hours of 7:15 to 8:15 a.m. and 4:30 to 5:30 p.m.

4.052
The impact of additional traffic due to station construction will be greatest at the intersection of State Route 18 and Hosmer Road. The scheduling of truck traffic will mitigate potential undesirable impacts. Experience indicates that almost all of the truck traffic will occur after 8 a.m. and before about 4 p.m. Monday through Friday. The economics of truck availability (minimum lost road time) dictate that the trucks arrive after the morning traffic peak and depart prior to the evening traffic peak, and that they arrive on construction work days when they can be unloaded.

4.053
The railroad access to the Somerset site has yet to be finalized. The route ultimately selected will be used to ship 400 to 500

carloads of freight to the site during construction. This will include very heavy loads such as the boiler drum, generator stator, and the transformers. It is expected that this number of shipments during station construction will not have an adverse impact on the system.

Highways, Bridges

4.053a
Transportation of heavy construction equipment and supplies to and from the site may have a severe impact on roads and bridges that are unable to bear heavy loads. For example, Hosmer Road which was originally concrete was widened with asphalt. Heavy traffic loads could cause it to separate. A number of area bridges, especially some of those constructed on timber pilings, are in critical condition. Several others, such as Bridge 86 located in the town of Newfane on Burt Road and constructed of four deck plates, also have a very low-bearing capacity. Niagara County Department of Public Works has provided a list of roads and bridges in the vicinity of the Somerset site that would be susceptible to stress associated with heavy equipment.

The applicant has agreed to meet with Niagara County officials to plan travel routes that would avoid these critical areas. Further, the applicant proposes as mitigative measures to reduce heavy loads and traffic volume. This is to be partially accomplished by having an onsite concrete batch plant. Other truck traffic will be reduced by utilizing the railroad for deliveries as much as practical. (The railroad is presently planned for completion in early 1981.) Transportation of heavy loads (i.e. greater than 80 tons) will require route reconnaissance and possibly special procedures to minimize impacts. Special permits are required for these types of loads on State roads.

Impact on Local Communities

Housing

4.054
It is estimated that five to 20 percent of the peak construction work force of 1,370 (between 65 and 262 workers) may relocate within 20 miles of the Somerset site. Of this work force, more than 50 percent, or approximately 35 to 150 workers, may reside full time; the remaining workers may reside locally only during the work week. Due to the relatively temporary nature of the project, most of the relocated workers are expected to rent rather than purchase a residence, especially those workers who may come from outside the local labor market. Hence there appears to be no expected problem in housing the 65 to 262 workers (and their families) that could relocate, especially since some "doubling up" is expected.

Education

4.055
As previously indicated, an estimated 65 to 262 workers will relocate in the nearby environs of the Somerset site. Assuming that more than 50 percent of 262 relocated workers have school-age children and that there is an average of 1.7 school-age children per family, there may be an increase of as many as 255 school-age children within the school districts surrounding the site. Local educational officials indicate that the school districts within the site environs would be able to accommodate the estimated increase in student enrollment without difficulty, assuming that students are evenly distributed throughout the various school districts.

Health

4.056
Local officials indicate that there will be no need to increase the capacity of the medical facilities in the area due to station construction. The three local hospitals, plus the mutual aid agreements among municipalities, should provide adequate facilities to handle any increase in the demand for medical care related to station construction.

Fire

4.057
It is considered that the fire-fighting facilities will be able to meet all community needs during the construction of the station.

Police

4.058
Local law enforcement officials indicate there may be a need to increase the manpower during the construction of the proposed station, although this could be done on an as-needed basis.

Sewage

4.059
According to local officials, there will be adequate sewage treatment facilities within 20 miles of the site to treat the additional sewage generated by the construction work force, their dependents, and the projected population of the area.

Water Supply

4.060
According to local officials, there will be adequate water treatment facilities within 20 miles of the Somerset site to meet the potable water needs of the construction work force, their dependents, and the projected population of the area.

Solid Waste

4.061
Landfill will be the most feasible type of solid waste disposal in Niagara County during the construction of the station. The station's sludge, nonsalvageable construction waste, and debris will be disposed of in an approved landfill. It is anticipated that the present solid waste disposal capabilities within 20 miles of the site will adequately handle the needs of the station during construction. Several disposal sites would likely be used for construction refuse such that no undesirable effects on fill capacity will be felt at any one site. It is possible that a private loadfill owner would be willing to accept all the solid waste.

Impact on Recreation

4.062
It is anticipated that the present recreational facilities will adequately serve the needs of the influx of the construction labor force and their dependents. At the peak of construction (1982) there will be an estimated projected population of 124,482 persons within a 20-mile radius. This will constitute an approximate ratio of one person per 0.049 acres of active recreational facilities, or 1,000 persons per 49 acres.

4.063
Recreational land uses in the vicinity of the site are not likely to be adversely affected by construction activities. Access to Golden Hill State Park, Camp Kenan, and Krull Park will probably be affected by increased traffic near the Somerset site and on Route 18. The impact would be greatest during the summer on weekdays when most construction traffic coincides with park visitations. The impact of construction-related noise on these facilities should be within acceptable limits.

Local Economy

4.064
The improvement of the railroad spur to the site and the expected influx of workers during the construction stage will stimulate new

service and retail jobs, trade, and sales tax revenue associated with these services. The short-term growth should gradually subside after peak construction. The number of services and retail jobs created during the construction phase is expected to be proportional to the number of workers who choose to temporarily relocate in the environs of the Somerset site. More than 100 of these temporary jobs may be created. Given present economic conditions, it is estimated that up to 95 percent of the jobs required during the peak year of construction at the Somerset site could be filled by the labor pool in the surrounding area.

4.065
Local officials foresee no problems in providing workers at the Somerset site, even during the peak period of construction, for the various trades, including pipefitters and electricians. It is anticipated that the large labor pools within commuting distances (Niagara Falls, Buffalo, and Rochester) would supply the personnel needed during the peak period of construction when and if the local unions with jurisdiction over the pertinent geographical area did not have enough available members to meet demand. Moreover, it is common practice for the local unions to seek aid in nearby areas before requesting workers from other regions.

IMPACT OF TRANSMISSION FACILITY CONSTRUCTION

4.066
Since the final transmission line route has not been selected, the following paragraphs present a generic discussion of possible impacts of transmission line construction in the local area.

Potential impacts resulting from transmission line clearing operations will result from vegetative canopy and groundcover removal. Temporary changes in surface hydrology and disturbance to wildlife will occur. As a result of grading requirements, surface runoff characteristics will be somewhat modified; no changes in topography are expected. Erosion control measures, including interceptor ditches, water bars, silt dams, pipe culverts, jute mesh, sodding, seeding, gravel stone, or mats will be implemented to minimize potential impact. Changes in soil conditions and increased runoff and siltation may occur as discussed under impacts of on-site construction activities.

4.067
The impact on wetland ecosystems from the installation of an overhead electric transmission line and right-of-way will vary depending on the specific wetland site features, the extent of clearing and construction that must be performed in the wetland, and the season when the operations are conducted. The impact on the wetland ecosystem can range from no impact to a high degree of impact, depending on the

factors mentioned above. An example of a wetland crossing resulting in no detrimental impact would be the crossing of a wetland where no vegetation clearing, no equipment operation or intrusion, and no pole or hardware placement occurs. A wetland crossing having a potential for a high degree of detrimental impact would be the crossing of a small, highly viable, flooded live deciduous or conifer tree wetland where the installation and operation of the electric transmission line would require: the complete removal of all vegetation that matures at heights greater than 25 feet; the placement of fill to construct a haul road (assumes culverts are installed for water drainage and flow equalization); the erection of structures in the wetland; and the periodic elimination of vegetation maturing at heights greater than 25 feet as a part of the long-term maintenance requirements of the facility.

4.068
Potential detrimental impacts that could result from a crossing of a wooded wetland include: loss of food, cover, nesting, and denning sites for wildlife; drying effects caused by increased solar radiation and wind velocity; alteration of water temperature by increased solar radiation; and temporary increase of water turbidity and suspended solids. The proposed alignment will traverse Hartland Swamp in the area slated for future acquisition by the State DEC as a wildlife management area. The DEC will not object to the crossing provided proper mitigative measures are taken to minimize the impacts mentioned above.

4.069
Herbicide application measures will be designed to limit application to the individual tree or stump being treated. No detrimental effects on fish and wildlife will occur as a result of herbicide use.

4.070
Impacts resulting from clearing and access road construction could be limited by the use of existing right-of-way for entire 17.8-mile transmission project.

4.071
Impacts resulting from clearing operations will also be limited due to the following practices: All required clearing will be done selectively, removing only material that might potentially interfere with wire security or as is required for construction and vehicular access. Woody material up to four inches in diameter will be piled, scattered, burned, or chipped. All woody material exceeding four inches in diameter will be limbed, freed of forks, and toplopped at a diameter of four inches. The material exceeding four inches in diameter may be disposed of by selling and removing from the site, piling or scattering. Unmerchantable logs may possibly be disposed of by burning.

4.072
Streams will be protected by the designation of buffer zones on each side of the stream. Within these zones, clearing and vehicular operation will be restricted to the maximum extent practicable. Crossing of streams with vehicles will be avoided wherever possible, but such crossing may be required where access is not available to both sides of the stream. In such cases, bank and bottom stability will be protected by use of temporary bridging, pipe, stone fill, flexible steel mesh, or other approved methods depending on stream conditions.

4.073
Wetlands will be avoided wherever practicable. If a wetland must be crossed, construction activities will be limited to dry or frozen periods to the extent practicable. These practices will minimize effects on surface hydrology, including streams.

4.074
Access road grading will be kept to a minimum. Access roads will be constructed and maintained for use by four-wheel drive equipment for the duration of the project. No permanent access road will be maintained across cropland, high intensity agricultural land, or orchards. Existence of these roads may cause increased disturbance in the transmission line area since they would provide access for intruders such as hunters, motorcyclists, snowmobilers, and recreational vehicle owners.

4.075
Since construction would most likely to be undertaken by members of the local work force, no additional strain on area facilities is expected. Noise impact due to transmission line clearing and construction will be similar to that resulting from standard construction equipment common to other construction activities, and no unacceptable impacts are expected.

4.076
Where transmission lines cross roads and highways, no effects other than a potential increase in visual impact are expected. There should be little or no disruption of traffic, since it is the applicant's policy to maintain traffic flow while constructing facilities. The same is true for railroads and navigable waters.

4.077
If it is necessary during construction operations to disturb existing grades down to the mineral soil, topsoil four inches or more in depth will be stripped, saved, and respread as soon as possible over the disturbed area in such a manner that smooth natural grades are obtained. Stripping will be done only where conventional stripping methods and equipment can be used.

4.078
All areas disturbed during clearing and construction will be seeded during construction operations. At the end of these operations, all areas will be returned to finished or original grades. Seeding and overseeding will be undertaken within the right-of-way as specified, except in areas that may have been covered by chipping operations.

4.079
Where large volumes of runoff are anticipated in interceptor ditches, the ditches will be stabilized with jute mesh or sodding. Where flow velocity is expected to be high, silt dams of logs or stones will be used to reduce velocity and collect silt. Where such ditches must be long, depending on runoff volumes, it may be desirable to use pipe culverts to avoid excessive ditch depth and to reduce grading requirements.

4.080
Where excessive damage to soils may occur due to wet conditions and heavy traffic, stabilization methods, such as use of gravel, stone, mats, or other methods best suited to the particular location may be employed.

4.081
All fuels, oils, chemicals, or other potentially harmful substances will be kept in appropriate tightly-capped containers, and handled, stored, and transported in such a manner as will minimize the likelihood of contamination.

4.082
Storage of material and equipment and locations of sanitary facilities within the right-of-way will be at a sufficient distance from streams, ponds, and other wet areas so as not to affect these areas. Washing of tools, equipment, and machinery, and storage of fuels, oils, chemicals, or other similar substances will not be permitted in or near such water areas.

4.083
During cleanup and construction operations, work crews will be required to clean up general debris and trash as they progress from one work location to the next. At the time all construction and planting operations have been completed, the site will be free of all construction debris, temporary structures, material, equipment, and all other items specified to be removed.

4.084
After completion of construction, all disturbed areas will be restored to original or finished grades or conditions. Exposed soils of access roadway surfaces, structure sites, parking areas, storage yards, cut

and fill slopes, and ditches will be seeded to perennial ground cover. Specific recommendations for seed, fertilizer, lime mixtures, rates, and mulching requirements will be determined at the time of application and will depend on specific site factors, soil test analysis, and time of year.

4.085
Permanent land use impact on active agricultural lands will be limited to structure foundations. Temporary losses may occur due to crop destruction and/or reduced yield caused by soil compaction. Crop loss should not exceed one growing season. A final route selection will be made by the Public Service Commission at the conclusion of its hearings. The following paragraphs discuss probable impacts associated with the route preferred by the applicant.

4.086
Examination of LUNR data indicates the following mileages of agricultural lands will be crossed by the transmission right-of-way proposed by the applicant as the preferred route:

Active agriculture	8.42 miles
Orchards	1.84 miles
Pasture	0.30 miles
Inactive agriculture	3.03 miles

4.087
Assuming a five-foot width and a 25-foot tapering length will be permanently lost for two sides of each pole of each supporting structure, and assuming an average of seven structures per mile, the maximum permanent loss would be 0.04 acres per right-of-way mile per circuit over active cropland. Permanent loss on pasture land or orchards is estimated to be 25 square feet per pole, which totals 0.008 acres per right-of-way mile per circuit. The maximum permanent loss for the route proposed by the applicant would then be:

Active agriculture	0.67 acres
Orchards	0.03 acres
Pasture	0.005 acres

4.088
Design flexibility of span lengths and lateral position will permit placement of many structures at field edges, along farm lanes, or on other nonproductive areas, thereby reducing these figures for permanent loss of agricultural land.

4.089
Temporary loss will result when access is required across cropland during the growing season. Assuming a 20-foot access road along the proposed right-of-way will be required in all cases, as well as a fabrication area of 100 feet by 150 feet at 750-foot intervals, and assuming every area of active agriculture will be interrupted for one growing season, a maximum temporary loss of crops will amount to 49.8 acres for the right-of-way proposed by the applicant as the preferred route.

4.090
Deep tillage, harrowing, winter cover crops, and natural freeze-thaw cycles will help minimize problems of yield loss that may be associated with construction-phase soil compaction. Access to structure locations by routes other than across the fields can also minimize any such problem.

4.091
Assuming that approximately 7.4 miles of new permanent access road are required, assuming a permanent width of 16 feet, and using the information from Table 2-6, Land Use, the following acreage of various existing land uses will be committed to access purposes if the route proposed by the applicant is selected:

Cropland	No access road
High Intensity Agriculture	No access road
Orchards	No access road
Pasture	0.58 acres
Inactive Agriculture	5.88 acres
Forest Brushland	4.20 acres
Forest	1.51 acres
Shrub wetland	0.23 acres
Wooded wetland	1.07 acres
Strip Commercial	0.10 acres
Recreation	0.66 acres

The above data indicate the probable effects if the applicant's proposed route is selected and is presented to show the impacts of one possible choice of four or more alternatives. It should be emphasized that actual acreages affected cannot be determined until a final route selection is made.

4.092
Wildlife may receive some benefit in greater food and cover through greater habitat diversity afforded by the proposed action. Mobility of most wildlife species will limit impacts on these species. Consideration will be given to the treatment of the right-of-way environment for the benefit of the wildlife species found in the

general area through which the right-of-way passes. Examples of these species are deer and grouse in wooded areas, rabbits and pheasants in open areas, and waterfowl and muskrat in wetland areas. In addition, care will be exercised to protect any rare, endangered, or uncommon species that have been appropriately identified in the project area. The principal philosophy will emphasize increasing vegetative diversity, particularly as may provide food and cover. Therefore, the degree of treatment will fit the specific need of each habitat traversed.

4.093
No threatened or endangered species permanently inhabit the area along the proposed route. Prior to transmission line construction, the right-of-way will be examined for critical wildlife habitats. Design flexibility of span lengths and lateral position will enable ameliorative action if critical habitats are encountered along the proposed route prior to construction.

4.094
The presence of the proposed transmission facilities will result in a permanent visual impact within the project area. Several factors, however, could substantially reduce the magnitude of the visual impact. Portions of the proposed transmission lines may be located on existing right-of-way owned by the applicant and which is currently unused, and the remainder could possibly parallel existing transmission lines.

4.095
If an archaeological resource is discovered during transmission line installation, work at that location will be stopped and the New York State Public Service Commission and the State Archaeologist will be notified. Appropriate mitigative measures will be undertaken as directed by the Commission.

MEASURES TO MITIGATE CONSTRUCTION IMPACTS

Blasting

4.096
Both underwater and surface blasting will be required at the site. Blasting will conform to the U.S. Army Corps of Engineers Manual "Safety-General Safety Requirements" EM 385-1-1 dated 1 March 1967, including the change dated 27 March 1972 and 1 June 1977 update; and to the U.S. Bureau of Mines guidelines for vibratory motion produced. To avoid adverse community reactions, the area residents will be notified of the blasting schedule prior to the commencement of blasting.

4.097
Minimal surface blasting is anticipated for the Somerset site. Only some surface removal of the rock strata in a few areas is required. This rock strata is of medium strength. Required blasting will be done by small charges which typically will be detonated twice a day at 12:30 and 4:30 p.m. and will last only one or two seconds. Based on prior experience with this blasting procedure, no adverse community impact is anticipated.

4.098
As mentioned in the aquatic ecology section, the applicant will attempt to minimize the impact of blasting on the aquatic ecosystem by using modern blasting techniques and devices to attenuate the shock wave. Additionally, no nearshore blasting will occur during fish spawning seasons.

Slash and Timber Disposal

4.099
Wooded areas to be cleared will be made available for commercial cutting. Vegetation not harvested commercially will be cleared and grubbed by conventional means. Unwanted vegetation from cleared areas will be either chipped, burned, or windrowed. Chips, where appropriate, will be mulched and used as part of the erosion control program and in landscape treatment.

4.100
After completion of construction in that area, temporarily disturbed areas will be cleared of construction-related material and non-vegetative erosion control implements. The area will then be restored according to the site restoration and landscape treatment plan designed for that particular area of the site.

Landscape Restoration

4.101
The primary objectives of the site restoration and landscape treatment plan are to minimize adverse effects of construction and operation by: visual and noise screening of the plant facilities; restoring vegetative cover to areas disturbed during construction; and providing food and cover for wildlife species by using a diversity of plant species in buffer plantings.

4.102
In general, areas to be disturbed will be cleared of vegetation, and the topsoil stripped and stockpiled either around the perimeter of the area or in a specific location within the site spoil area. All topsoil removed from disturbed areas will be reused as part of the revegetation scheme for the site. It will be necessary to regrade portions of the site, especially in the main plant area. This will entail both excavating and filling.

4.103
Revegetation of 106 acres of construction area and 177 acres of agricultural land, deserted orchards, and open fields during and after construction of the facility will help mitigate the loss of existing natural areas to the proposed facility. Many of the plantings will include trees and shrubs to decrease the time required for establishing woody cover types. Most of the species selected should not compete adversely with desirable native plants. Restoration plans will increase woodlands from 10 to 21 percent and shrub communities from one to five percent of the site. The diversity and interspersion of woody plant communities on the site following restoration will probably increase the rate of invasion of woody plants into open areas. Because of the large number of variables influencing succession (e.g., natural seeding mechanisms, climatic variation, previous agricultural practices), the species composition and rates of succession cannot be accurately predicted. Future plant communities of open fields on the site should develop into early seral stage woodlands within 40 to 60 years, and species composition will probably be similar to that presently occurring in the wooded areas on the site. Native plant species are adapted to the soils, hydrology, and climatic factors in the region, and they should be more successful on the site than most introduced species. After construction, a large portion of the present active agricultural land (approximately 435 acres) will be available for leasing as agricultural land. Areas not returned to agricultural use or not revegetated will be allowed to undergo natural succession.

4.104
The site restoration program includes approximately 185 acres of shrub and woodland plantings. The plant species selected will provide wildlife food and cover. The shrubs (e.g., dogwood, elder, grape, and viburnum) provide particularly good food and cover for song birds, ring-necked pheasant, cottontail, raccoon, and deer. The revegetated areas and undisturbed natural vegetation interspersed with agricultural land should provide diverse wildlife habitat on the site. Implementation of the long-term site restoration and erosion control plans should help mitigate most of the habitat losses associated with construction of the facility.

ENVIRONMENTAL IMPACT OF PLANT OPERATION

IMPACT OF HEAT DISSIPATION SYSTEM

Effluent Limitations and Water Quality Standards

4.105
The Federal effluent limitation on the discharge of heat to a surface water body from a new steam electric generating point source such as the proposed station is found in 40 CFR 423.15. The Federal standards state that there shall be no discharge of heat from the main condensers except:

> Heat may be discharged in blowdown from recirculated cooling water systems provided the temperature at which the blowdown is discharged does not exceed at any time the lowest temperature of recirculated cooling water prior to the addition of the make-up water; and
>
> Heat may be discharged in blowdown from cooling ponds provided the temperature at which the blowdown is discharged does not exceed at any time the lowest temperature of recirculated cooling water prior to the addition of the make-up water.

The Federal effluent limitation mandates the use of a closed-cycle condenser cooling system for new sources. The New York State Water Quality Standards and Criteria for thermal discharges to Lake Ontario are found in 6 NYCRR Part 704. The standards and criteria are presented on Table 4-4.

4.106
The applicant's proposed facility will exceed the Federal effluent limitation which mandates the use of a closed-cycle condenser cooling system and virtually no discharge of heat whatsoever in that the applicant proposes to utilize a once-through condenser cooling system which will discharge appreciable amounts of heat to Lake Ontario. In addition, as discussed in the following section, the applicant will exceed the New York State Water Quality Criteria, 6 NYCRR 704.2(b)(3)(i), in that the applicant will raise a small portion of the surface of the lake more than 3°F.

TABLE 4-4

NEW YORK STATE WATER QUALITY STANDARDS
AND CRITERIA FOR THERMAL DISCHARGES

"Section 704.1 Water quality standard for thermal discharges.

(a) All thermal discharges to the water of the State shall assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water.

(b) The criteria contained in this Part shall apply to all thermal discharges and shall be complied with, except as provided in this Part.

704.2 Criteria governing thermal discharges.

(a) General criteria. The following criteria shall apply to all waters of the State receiving thermal discharges...:

(1) The natural seasonal cycle shall be retained.

(2) Annual spring and fall temperature changes shall be gradual.

(3) Large day-to-day temperature fluctuations due to heat of artificial origin shall be avoided.

(4) Development or growth of nuisance organisms shall not occur in contravention of water quality standards.

(5) Discharges which would lower receiving water temperature shall not cause a violation of water quality standards and Section 704.3 of this Part.

(6) For the protection of the aquatic biota from severe temperature changes, routine shutdown of an entire thermal discharge at any site shall not be scheduled during the period from December through March.

(b) Special criteria. The following criteria shall apply to all waters of the State receiving thermal discharges...:

* * *

(3) Lakes. (i) The water temperature at the surface of a lake shall not be raised more than three Fahrenheit degrees over the temperature that existed before the addition of heat of artificial origin.

(ii) In lakes subject to stratification as defined in Part 652 of this Title, thermal discharges that will raise the temperature of the receiving waters shall be confined to the epilimnion.

(iii) In lakes subject to stratification as defined in Part 652 of this Title, thermal discharges which will lower the temperature of the receiving waters shall be discharged to the hypolimnion, and shall meet the water quality standards contained in Parts 701 and 702 of this Title in all respects.

704.3 Mixing zone criteria. The following criteria shall apply to all waters of the State receiving thermal discharges,...

(a) The department (of Environmental Conservation) shall specify definable, numerical limits for all mixing zones (e.g., linear distances from the point of discharge, surface area involvement, or volume of receiving water entrained in the thermal plume).

(b) Conditions in the mixing zone shall not be lethal in contravention of water quality standards to aquatic biota which may enter the zone.

(c) The location of mixing zones for thermal discharges shall not interfere with spawning areas, nursery areas and fish migration routes."

4.107
Therefore, pursuant to Section 316(a) of the Federal Water Pollution Control Act amendments of 1972, the applicant has prepared a statement with the intention of showing that its proposed once-through cooling system and the resultant discharge will not significantly disrupt the propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the lake.

4.108
There is an equivalent opportunity pursuant to New York State regulation (6 NYCRR 704.4) for an applicant to obtain modification of the above-listed criteria under 704.2-704.3 if it can be shown that said modification would assure the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife on the lake. With the exception of 6 NYCRR 704.2j(3)(i), the applicant will meet all New York State Water Quality Standards found in 6 NYCRR Part 704. Compliance with these standards is demonstrated in the following sections in this chapter.

Physical Impacts

4.109
This section will present the results of the analysis of the discharge and intake flows discussed in Chapter 1, "Intake Structure" and "Discharge Structure." The presentation will be categorized in terms of the regions defined in that section. All of the results discussed below are for full plant load.

Initial Jet Mixing Region

The analysis of the flow leaving each discharge port yielded the following information:

- Temperature and velocity exposure vs. distance along the plume centerline. These results are present in Table 1-27.

- The maximum induced temperature rise on the bottom and at the surface were calculated to be as follows:

	Surface	Bottom
Maximum induced velocity	1.9 fps	4.0 fps
Maximum induced temperature rise	4.2°F	6.7°F

These values are conservative estimates of maximum excursions that will occur over extremely small bottom and surface areas.

Near Field Mixing Zone

4.110
The physical model study determined the three dimensional near field temperature distribution for ambient current velocities of 0, 0.25, and 0.6 fps. Figures C-1 through C-6 (Appendix C) show the surface and cross sectional distributions of induced temperatures for these cases. Table 1-28 gives the total surface area occupied by surface temperature increase as a function of relative probability for various seasons.

Transient Far Field Plume Region

4.111
The basic assumptions and structure of the transient plume model are shown in Figure C-7. The transient plume computations were made for periods of time taken for all seasons of the year. The computed distribution of surface temperature rise for these periods are shown in Figures C-8 through C-11 (Appendix C). In addition, Figures C-12 through C-15 show the variation with time of the induced temperature rise at the location of the diffuser. This location is significant in that the induced far field transient plume temperature at that point will be superimposed upon the induced near field temperature rises. Because of the intermittent nature of the far field transient plume temperature rise at any point, it was concluded that average rather than maximum values should be used to characterize this region. The computed annual average far field temperature rise at the diffuser location is 0.21°F. The average temperature increase for different seasons was not significantly different from this value.

Other Features of the Physical Impact of Intake and Discharge Flows

4.112
On the basis of the results summarized above, the following additional conclusions were reached concerning the physical impact of the heat dissipation system on the receiving water.

- The annual mean increased evaporation loss from Lake Ontario will be 9.95 cfs.

- The maximum induced rate of change of surface temperature will be 0.69°F for a 20 second period corresponding to the loss of one circulating pump.

- The plant intake and discharge flows will have negligible effect on the season stratification structure of Lake Ontario.

- The velocities induced by the intake and discharge will not modify the general circulation pattern in Lake Ontario.

Biological Impacts

4.113
The circulating water system has four major mechanisms for directly modifying the aquatic biota: thermal exposure to the plume; intake impingement; intake entrainment; and exposure to discharge chemicals. Each of these mechanisms was taken into consideration in determining the design, location, and capacity of the proposed facility at the Somerset site so as to minimize the impact resulting from these sources. A discussion of the process of design selection and estimates of the impact resulting from normal station operation follow.

4.114
Primary factors influencing the siting of intake and discharge structures include:

- Areas of greatest biological activity are located inshore and along the bottom of the lake, with the exception of fish larvae which occur mainly near the surface.

- Phytoplankton and zooplankton are distributed relatively uniformly except at nearshore areas where wave scouring occurs.

- Fish distributions as determined from gill net sets show that the majority of the fish are located inshore. In collections at the 25- and 50-foot depth contours, the higher catches were taken at the bottom. The predominant fish species were white perch, alewife, and smelt. No particular species dominated at the surface or mid-depth.

- Ichthyoplankton studies revealed that eggs were mostly at the bottom with larvae occurring mainly at the surface and secondarily in the mid-depths. Ichthyoplankton were comprised primarily of smelt in May and June, while alewife dominated in July and August.

4.115
Consequently, a zone extending from the bottom to approximately five feet above the bottom was removed from consideration due to the following factors: the susceptibility of benthic organisms to scouring and thermal impact; the density of bottom-oriented fish; the density of demersal eggs; merobenthic crustacean density (Gammarus sp.) and the utilization of this zone by larval stages of fish. Although physical location of intake and discharge structures in the zone was considered to be permissible, it was deemed advisable to minimize the physical effects of water withdrawal and thermal addition.

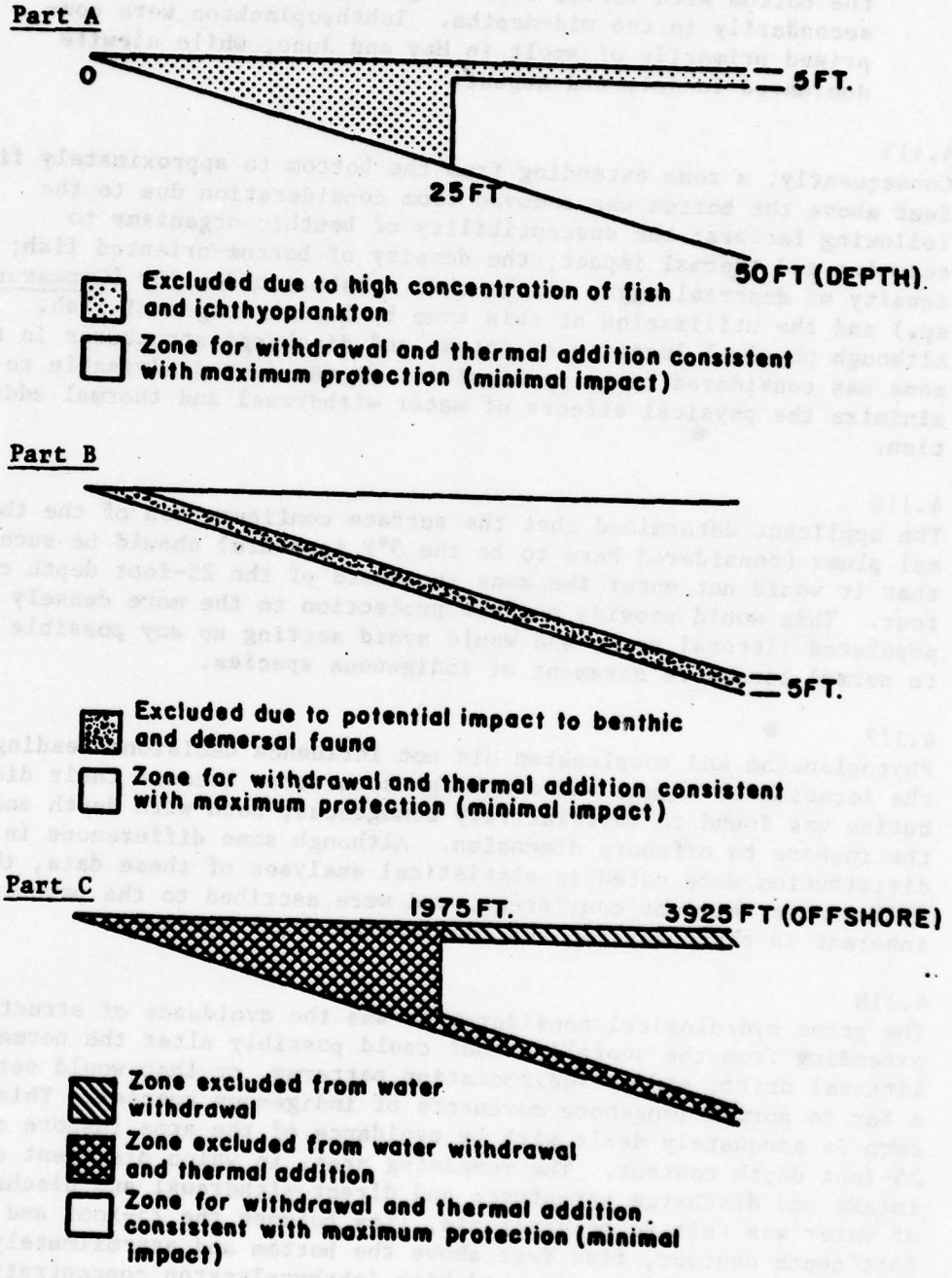
4.116
The applicant determined that the surface configuration of the thermal plume (considered here to be the 3°F isotherm) should be such that it would not enter the zone shoreward of the 25-foot depth contour. This would provide maximum protection to the more densely populated littoral zone, and would avoid setting up any possible bar to normal longshore movement of indigenous species.

4.117
Phytoplankton and zooplankton did not influence decisions leading to the location of intake and discharge structures because their distribution was found to be relatively homogenous, both with depth and in the inshore to offshore dimension. Although some differences in distribution were noted in statistical analyses of these data, the differences were not consistent, and were ascribed to the patchiness inherent in phytoplankton and zooplankton distributions.

4.118
The prime hydrological consideration was the avoidance of structures extending from the shoreline that could possibly alter the normal littoral drift, and/or sedimentation patterns, or that would serve as a bar to normal longshore movements of indigenous species. This concern is adequately dealt with by avoidance of the area inshore of the 25-foot depth contour. The remaining area, in which placement of intake and discharge structures and direct withdrawal and discharge of water was felt to be desirable, lies between the 25-foot and 50-foot depth contour, five feet above the bottom and approximately five feet below the surface to avoid high ichthyoplankton concentrations (Figure 4-1).

FIGURE 4-1

SOMERSET SITE BIOLOGICAL CONCENTRATIONS
CONSIDERED IN PLACEMENT OF INTAKE AND DISCHARGE STRUCTURES



4.119
Through the use of both biological and engineering data, potential impacts have been minimized by locating intake and discharge structures in a zone of low biological activity and designing these structures and their capacity in a manner which will assure maximum protection. Final design, based on biological, engineering, and economic considerations, locates intake and discharge structures in waters between the 25-foot depth contour and the 50-foot depth contour with a capacity resulting in a T of 35°F and associated cooling water intake flow of 528 cfs. The potential impact of operation of this design is detailed in the following sections.

Thermal Exposure to the Plume

4.120
Organisms in the vicinity of the plume will be exposed to elevated temperatures in two ways: planktonic organisms may be drawn into the heated water with the dilution water; and strongly swimming organisms may voluntarily enter the lower velocity regions of the plume and exist at a higher temperature until they swim off or can no longer maintain themselves against the induced current of the discharge.

Additionally, survivors of entrainment (plankton and immature fish) will be subject to an extended period of thermal exposure if they have been stressed by the initial shock of traveling through the cooling water system. Larger nektonic forms, such as fish, may attempt to avoid areas of high current velocity (Sonnichsen et al., 1973). Thus, dilution water exposure may be largely restricted to planktonic forms.

Most fish are capable of avoiding thermal stress by selecting preferred temperature regimes (Otto et al., 1975) or by behavioral thermoregulation (Romberg et al., 1973).

4.121
Transit in the plume will consist of the successive time and temperature exposures presented in Table 4-5. The rapid dissipation of the heated effluent is expected to eliminate the more serious effects of heat on plankton forms, although some short-term modification of productivity may result from this exposure. Possible effects of plume exposure on specific organisms are discussed below.

Phytoplankton

4.122
The range of temperature tolerance of phytoplankton species is usually fairly wide (Patrick, 1974). Thermal tolerance ranges are highly dependent on inter-specific competition and ecological

TABLE 4-5

DISCHARGE PLUME CHARACTERISTICS FOR THE SELECTED DESIGN T

Isotherm (°F)	Total Time (sec)	Total Flow	Velocity (fps)	Volume (ft^3)
35	0.88	528	15.00	595
32.5	0.95	569	13.93	740
30	1.04	616	12.86	928
27.5	1.15	672	11.79	1,218
25	1.30	739	10.71	1,610
22.5	1.50	821	9.64	2,219
20	1.79	924	8.57	3,161
17.5	2.20	1,056	7.50	4,713
15	2.85	1,232	6.43	7,482
12.5	3.89	1,478	5.36	12,920
10	5.83	1,848	4.29	25,245
9	7.09	2,053	3.86	33,901
8	8.86	2,310	3.43	49,300
7	11.44	2,640	3.00	73,588
6	15.41	3,080	2.57	116,870
5	22.00	3,696	2.14	201,956
4	34.13	4,620	1.71	394,444
3.6	41.86	5,133	1.54	541,082

variations (e.g., pH, nutrient levels). Cairns (1956) found that when natural populations, at an ambient temperature of 18 to 20°C (64.6 to 68°F), were subjected to chronic thermal stress, diatoms were dominant from 20 to 30°C (68° to 86°F), green algae from 30 to 35°C (86 to 95°F), and blue-greens at temperatures in excess of 35°C (95° F). This study also indicated that all the organisms in a specific group were not killed when the temperature exceeded their tolerance limits, but that the species were not able to compete successfully with species of other groups better adapted to the higher temperature range. Strickland (1969) and others have also pointed out that abundance of diatoms is nutrient level dependent, as well as temperature dependent. Thus, in nature, dominance may shift in favor of non-diatom groups at lower temperatures if nutrient levels do not favor diatom growth.

4.123
A phytoplankter entrained into the plume at the discharge and traveling with it until mixing is complete will be exposed to elevated temperatures (greater than 3°F above ambient) for less than one minute (Table 4-5). Since this plume exposure time for a phytoplankter is extremely short, relative to generation times, no significant change in growth rates of any phytoplankton species are expected. Similarly, generation times, which are on the order of a day or less, are not expected to be altered by the very brief exposures.

4.124
The estimated increase in background temperature of the lake due to operation of the proposed facility is on the order of 0.005°F. (See "Physical Impacts," above). No significant changes in growth rates or differential mortalities of any species are anticipated, nor are any shifts in species structure of the phytoplankton expected as a result of operation of the proposed facility. However, should any changes occur, they would be highly localized.

Zooplankton

4.125
Available data for representative zooplankton species from temperature ecosystems similar to Lake Ontario suggest that zooplankton may become immotile for periods of several hours when subjected to abrupt thermal stress, or may be killed if the stress is of high magnitude or sufficient duration. Immotile or dead zooplankton still serve as food for higher organisms, and the availability of such a food supply may account in some degree for the increased concentrations of fish noted in some thermal discharge zones. Gehrs (1974) suggests that zooplankton may avoid high temperatures and that surface waters heated by thermal effluents can restrict the movement

of zooplankters, possibly resulting in decreased secondary productivity in the zone influenced by the thermal plume, and thereby negating the effect of immotile or dead zooplankton previously mentioned.

Other studies show that zooplankton populations demonstrate a tendency for populations to increase with temperature, short of lethal levels (Smith, 1972), (Churchill and Wojtalik, 1969). However, zooplankton yields may decrease with highest summer temperatures.

4.126
Krueger (1975) determined that the effective temperatures (ET_{50}) at which half the population became immotile for Cyclops and Diaptomus ranged from 25 to 34°C for acclimation temperatures from 5 to 25°C.

The inactivation of motile response does not imply the organisms were dead, as all Cyclops and most of the Diaptomus tested were fully recovered and motile at the end of the tests. It may be safely inferred that LT_{50} is greater than ET_{50}, since all the organisms tested recovered from thermal shock.

4.127
The impact on the aquatic ecology of Lake Ontario, as a result of entrainment of zooplankton in the plume, is expected to be negligible. Some minor modifications in the vertical distribution of zooplankton may occur as a result of behavioral avoidance of heated waters. However, since there is no indication that this occurs at other operating stations on the lake, either no active avoidance occurs or such avoidances are masked by the inherent patchiness of the zooplankton distribution. During the highest summer month temperatures some depression in zooplankton populations may occur in the localized area near the proposed plant, while the yield may increase in colder months.

Benthos

4.128
Benthos would be affected by the thermal discharge only while the plume was in contact with the bottom. As indicated under "Initial Jet Mixing Region," above, temperature excursion on the bottom would be 6.7°F above ambient with an accompanying maximum current of four fps. Chironomids, a common benthic group, have been found to have LT_{50}'s ranging from 29°C (84.2°F) to 35.5°C (101.8°F) (Walshe, 1948). Gammarus spp. have been found to have LT_{50}'s from 22°C (71.9°F) to 26°C (78.8°F) when acclimated to 18°C (Smith, 1973). Although it is likely that benthic organisms could survive the 6.7°F increase in temperature, the excess velocity may remove the organisms in the small bottom area involved. The elevation of the discharge

ports above the bottom and the buoyant nature of the plume will prevent the higher temperature isotherms from contacting the bottom. The impacted benthic organisms are expected to be limited to a zone with a radius of approximately 15 feet at each of the nine discharge ports, and a total area of less than 0.5 acres. Therefore, it is expected that operational impacts on the benthos will be minimal and confined to a small area in the immediate vicinity of the diffuser.

Fish

4.129
Thermal exposure of fish being drawn in with the dilution water should be a relatively rare occurrence, due to the high velocities of the diffuser and the ability of the fish to detect and avoid areas of high current. Although exposure in the plume from the point of discharge to the 15°F isotherm above ambient is theoretically capable of causing mortality to all fish species found at the site, the time of travel through this segment of the plume would be less than three seconds (Table 4-5) because of the high velocities. Experiments indicate that the time required for fish body temperatures to approach equilibrium with the temperature of the ambient water in field studies is measured in minutes (Spigarelli et al., 1972). The mortality estimates obtained for the short-duration exposures in the plume are very conservative, and mortalities will probably not occur since body temperatures will not be significantly altered during the short period of plume passage.

4.130
The other forms of thermal exposure to fish will result if an organism established itself on the lower temperature regions of the plume where the plume velocity is reduced in comparison to the initial discharge velocity of 15 fps. Table 4-5 presents the velocities and temperatures occurring concurrently in the discharge plume. A fish actively seeking to occupy the plume will have to swim against these velocities in order to achieve the accompanying higher temperature environment.

4.131
In order to determine the possibility of fish penetrating the plume, some available fish swimming speed data were examined. Since damaging exposure to low level thermal stress is in terms of hours, only by using cruising speed can fish maintain themselves in the plume for a dangerous length of time. All Lake Ontario fish species for which data are available have cruising speed capabilities of less than 2.8 fps. Brown trout have a cruising speed of 2.5 fps and lake trout 1.02 fps. Those with the lowest cruising speed (less than one fps) are bluegills, white crappie, pumpkinseed, quillback, and white perch. The highest isotherm to which any fish present at the site

could penetrate would be the 10°F above ambient where the plume current velocity would be 4.20 fps (Table 4-5).

4.132
Since fish often seek refuge from higher current velocities in zones of quiet water, it is unlikely they would seek to maintain themselves against the plume currents when ambient lake currents are much lower. Although spawning salmonids will swim into high current velocities, they will also avoid warmer waters at this time. In addition, the buoyant nature of the plume will tend to move the warm water toward the surface of the lake and away from the bottom zone in which most of the fish tend to congregate.

4.133
In addition to the above factors, behavioral avoidance by many species will prevent exposure to the elevated temperatures in the thermal discharges. In avoidance tests for several fish species present at the Somerset site, temperatures were increased until a point was reached at which the fish would no longer enter the warmer of the two areas, which was then defined as the avoidance temperature. Avoidance temperatures for cold water forms varied more with both species and acclimation than for warm water forms such as yellow perch. Preference experiments for species found in Lake Ontario were also conducted (Table 4-6).

4.134
Research on Lake Monona, Wisconsin relating to the avoidance or preference of a thermal discharge in the littoral zone showed that several species tended to be more abundant in the heated outfall areas than in unheated surrounding areas (Neill and Magnuson, 1974). Among these were carp, largemouth bass, and rock bass which also occur at the Somerset site. Certain species, among them rock bass and yellow perch, were found to have body temperatures independent of capture temperatures, indicating an ability in these fish to regulate body temperatures by habitat or water temperature selection. Both of these species had body temperatures below habitat temperature. Temperature preference and avoidance experiments performed on several fish species present at the Somerset site indicated that preferred temperatures were usually equal to or slightly higher than acclimation temperatures. Therefore, the fish species tested would only select temperatures in the plume where the plume was near or slightly above ambient, thereby limiting the possibility of thermal stress. Similarly, it was noted in the avoidance tests that many species initially preferred a slight increase in temperature, but that as the temperature was increased, active avoidance of the higher temperature would be elicited. These behavioral responses would prevent fish from suffering thermal mortalities, since they would not seek the higher plume temperatures. The fact that preferred temperatures were

TABLE 4-6

AVOIDANCE TEMPERATURES OF LAKE ONTARIO FISH
(Excerpted from Otto et al, 1975)

Species	Acclimation Temperature (°C)				
	5	10	15	20	25
Brown Trout	-	21.5	-	-	-
Chinook Salmon	20.0	21.5	23.5	-	-
Coho Salmon	19.5	22.0	24.5	23.5	-
Lake Trout	17.5	18.0	22.0	-	-
Rainbow Trout	20.5	21.5	23.5	24.5	-
Rainbow Smelt	10.5	16.0	-	-	-
Slimy Sculpin	15.0	19.0	23.0	-	-
Yellow Perch	26.0	30.0	31.0	31.0	33.0

PREFERENCE TEMPERATURES OF LAKE ONTARIO FISH
(Excerpted from Otto et al., 1975)

	Acclimation Temperature(°C)				
Golden Shiner	18.6	22.2	25.6	25.8	27.2
Lake Trout	9.0	8.7	10.8	-	-
Rainbow Trout	12.2	13.5	14.9	16.0	-
Slimy Sculpin	8.5	-	11.1	-	-
Yellow Perch	16.9	19.7	20.0	25.2	26.4

usually only slightly higher than acclimation should insure a safe return to ambient, and thereby reduce the possibility of cold shock.

4.134a. Gas Bubble Disease - While the total gas saturation levels (N_2 saturation level x 0.8 plus O_2 saturation level x 0.2) of the cooling water may be elevated to levels approaching 155 percent during plant passage, the discharge of these waters is not expected to cause any incidence of gas bubble disease in the aquatic populations. The discharge from the facility has a high velocity which effectively prevents long-term exposures to gas saturation levels greater than 110 percent. In addition, the transit time of organisms entrained into the plume is of sufficiently short duration to assure that internal body temperature and consequent internal gas saturation values will not be significantly altered and will thereby prevent gas bubble disease.

4.135
The research performed by Neill and Magnuson on Lake Monona indicates that yellow perch were found to avoid the discharge area at a statistically significant level.

Studies on Lake Michigan (Edsall and Yocum, 1972) indicate the presence of yellow perch in thermal discharges during the winter. A study by Storr and Schlenker (1974) in Lake Ontario contradicts the Edsall and Yocum report in that yellow perch seemed to exhibit little attraction to the warmer waters of a heated discharge.

Corps staff reviewed the applicant's baseline fish sampling results and found that yellow perch comprised between 3.0 and 7.0 percent of the total catch depending on the time of year and type of gear used. Impingement data (1973) from the Ginna Nuclear plant near Rochester, NY, also show low numbers of yellow perch. Staff believes that exposure of relatively small populations of yellow perch to the Somerset discharge will ocurr intermittently for short time spans. This should result in a negligible impact on the population at the site.

Ichthyoplankton

4.136
Ichthyoplankton are probably the planktonic form most susceptible to thermal stress. Their maximum tolerable body temperatures are characteristically much lower than phytoplankton species or zooplankton species inhabiting the same body of water. Yellow perch eggs have a maximum tolerable body temperature of about 68°F (20°C) and carp eggs in the later stages of development can tolerate about 104°F (40°C). Eggs or yolk-sac larvae entrained into the plume at the discharge and traveling with it until mixing is complete will be exposed to elevated temperatures (greater than 3°F above ambient) for

less than one minute. Although this short exposure time may minimize the impact, the rapid change from ambient temperature (prior to contact with the discharge) to discharge temperatures (approximately 35°F above ambient) and then back to near ambient (after mixing) could stress ichthyoplankton enough to cause some mortalities. The location of the discharge structure away from areas of high ichthyoplankton concentration should help reduce the impact on populations.

Impingement

4.137
Impingement occurs when organisms, predominantly fish, enter the intake structures and are trapped against the 0.375-inch mesh screens used to remove debris from the cooling water before it passes through the pumps and condenser. The number of fish likely to be impinged during operation of a thermal power plant is a function of both biological and physical parameters. Biological factors include the species in the area and their abundance, size, swimming speed, behavioral responses to intake water currents, and seasonality, while physical factors include intake design and location, the volume of water withdrawn, and the velocity of the water approaching the intake ports. Table 4-7 summarizes design parameters of intake structures for two existing and one proposed power plant on Lake Ontario.

The design parameters for the Cayuga Station at Somerset are somewhat more conservative in that the velocity at the intake port will be 0.5 fps with the total volume of water withdrawn at a rate of 528 cfs. In addition, the structure will be five feet above the bottom (19 feet below the surface and approximately 2,100 feet offshore). This is an advantage over some structures that are situated nearer the bottom (i.e., Nine Mile Point's intake structure is three feet off the bottom) because the lake bottom zone is generally considered an area of higher biological activity.

TABLE 4-7

COMPARISON OF THE INTAKE DESIGN PARAMETERS OF THE STERLING, GINNA, AND NINE MILE POINT UNIT 1 POWER PLANTS

Parameter	Proposed Sterling[a]	Ginna[b]	Nine Mile Point 1[c]
Volume of water withdrawn (cfs)	1,860	892	600
Intake location			
Depth (ft)	35.5	33	18
Distance from shore (ft)	4,200	3,100	850
Velocity			
At the intake ports (fps)	1.5	0.8	2.0
In the intake tunnel (fps)	10.3	11.0	8.0
At the traveling screens (fps)	2.2	0.8	0.8

[a] ER, Sect. 3.4.2.1.

[b] U.S. Atomic Energy Commission, Directorate of Licensing, Final Environmental Statement, R.E. Ginna Nuclear Power Plant, Docket No. 50-244, December 1973.

[c] U.S. Atomic Energy Commission Directorate of Licensing, Final Environmental Statement, Nine Mile Point Nuclear Station, Unit 1, Docket No. 50-220, January 1974.

4.138
Estimates of potential annual impingement at the Cayuga Station were based on observations of the numbers of impinged fish collected at Niagara Mohawk's Nine Mile Point (MP) station. Two species, alewife and rainbow smelt, which were common in the vicinity of the Somerset site, were also abundant at NMP and predominated in impingement incidences. Alewife and rainbow smelt have been shown to be susceptible to impingement at all operating power plants on Lake Ontario, primarily during the period of spring die-off when dying and debilitated alewives are apparently unable to avoid the intake.

4.139
In determining the total numbers of fish impinged on an annual basis, the applicant has assumed population densities and species compositions at Somerset to be similar to that at NMP. Since studies by the New York State DEC at Cape Vincent, NY, indicate that fish populations are not homogeneous throughout the lake, fisheries data have been examined to determine the general comparability of the Nine Mile Point data to the Somerset data in order to assess the applicability of NMP impingement records to Somerset.

Table 4-7a presents a complete listing of the species caught in gillnets by percent composition at the two sites for the years 1975 and 1977. Several points must be kept in mind when comparing the data from the two sites. While the gear used is comparable, the number of sets, the depths of deployment, timing, and total fishing effort differs, and these types of sampling differences make comparisons between programs difficult; therefore, caution must be used in drawing conclusions.

General comparisons of the species composition have been made. The dominant species at both sites are alewife, spottail shiner, and rainbow smelt. These species together with white perch make up the bulk of the fish catches at both sites. The order of dominance differs from year to year and from site to site; however, the dominant species are essentially the same. The table below indicates the order of dominance of alewife, rainbow smelt, spottail shiner, and white perch at Nine Mile Point and Somerset in two recent years.

	1975		1977	
	Somerset	NMP	Somerset*	NMP
Alewife	1	1	3	2
Rainbow Smelt	2	4	2	4
Spottail Shiner	3	2	1	1
White Perch	4	3	5	3

*Lake Chub was No. 4 at Somerset in 1977.

Table 4-7a

Percent Composition of Fish Caught in Gillnets at Nine Mile Point and Somerset in 1975 and 1977

Species	75 NMP(a)	75 Somerset(b)	77 NMP(a)	77 Somerset(b)
Alewife	72.25	56.90	25.8	3.84
Spottail Shiner	12.81	17.92	27.1	41.30
White Perch	5.58	3.29	16.4	2.68
Rainbow Smelt	2.55	20.25	12.9	41.21
Yellow Perch	1.48	0.25	5.4	0.54
Gizzard Shad	1.24	0.05	1.2	0.09
Trout Perch	0.96	-	3.2	-
White Sucker	0.94	0.30	2.3	1.52
Smallmouth Bass	0.62	0.025	0.5	-
Rockbass	0.43	0.10	0.8	0.18
Brown Trout	0.27	0.10	0.2	1.78
Lake Chub	0.19	0.46	0.5	3.12
White Bass	0.14	-	1.3	-
Brown Bullhead	0.13	0.025	0.2	-
Stonecat	0.11	-	0.5	-
Coho	0.07	0.13	0.04	0.09
Lake Trout	0.04	0.025	0.1	0.71
Chinook	0.03	0.025	-	1.25
Rainbow Trout	0.03	-	0.1	0.09
Pumpkinseed	0.02	-	0.008	-
Carp	0.01	0.025	0.012	0.27
F. W. Drum	0.02	0.025	0.004	0.27
Sculpin	0.01	0.10	0.1	0.09
Burbot	0.01	-	-	-
Longnose Gar	0.006	-	-	-
Lamprey	0.006	-	-	-
Northern Pike	0.004	-	-	-
Walleye	0.004	-	0.008	-
Northern Hogsucker	0.003	-	0.004	-
Splake	0.003	-	0.5	0.98
Black Crappie	0.001	-	-	-
Bluegill	0.001	-	0.004	-
Brook Trout	0.001	-	-	-
Channel Catfish	0.001	-	-	-
Cisco	0.001	-	0.004	-
Longnose Sucker	0.001	-	-	-
Redfin Pickerel	0.001	-	-	-
Goldfish	0.001	-	0.004	-
American Eel	-	-	0.02	-
Stickleback	-	-	0.004	-
Cyprinadae	-	-	0.008	-
Emerald Shiner	-	-	0.02	-

(a) All NMP Gillnet samples
(b) Transect 5 samples only.

More species of warmwater sports fish were caught at NMP than at Somerset. However, since more species were collected at NMP than at Somerset, these differences could be attributed to the differing level of sampling effort at the two sites. The populations at the two sites are similar, especially in respect to the more abundant species. Thus, the use of NMP impingement data to obtain an estimate of Somerset impingement is considered to be a valid technique.

Therefore, by correcting for the lower flow volume of 528 cfs at Somerset (NMP flow volume is 557 cfs), an estimated impingement rate of 2.9 million per year is expected by the applicant. Alewife account for 92.4 percent (2,680,000) and smelt account for 3.6 percent (104,000). These estimates are considered conservative in that no corrections have been applied for differences in intake velocity. Table 4-8 presents a list of fish expected to be impinged at the Cayuga Station based on impingement collections at Nine Mile Point from 1973 to 1975.

4.140
Since these data have been based entirely on impingement rates experienced at NMP, actual impingement rates for Somerset can be expected to differ. This information, however, can serve as a realistic indicator of potential impacts and provide a basis from which extrapolation assessments can be made.

Corps staff has reviewed the 1973 impingement data from the Ginna Nuclear Power Plant which is in closer proximity to Somerset than the power plant used in the applicant's analysis. These data were compared to the applicant's projected catch (Table 4-8) to determine the validity of the relative abundance shown in the applicant's projected impingement. The data correlated closely, with alewife and rainbow smelt being impinged in the highest numbers. At Ginna, spottail shiner, three-spine stickleback, sculpin, white perch, emerald shiner, gizzard shad, and white bass are impinged in higher numbers than other fish species (exclusive of alewife and rainbow smelt). The applicant's projections also include these species among those impinged in the highest numbers.

Table 4-9 lists numbers of game fish impinged at Rochester Gas and Electric Company's Ginna plant near Rochester, NY. Table 4-10 shows impingement of alewives and rainbow smelt at Ginna. Since the Ginna station is in close proximity to the proposed Somerset site, it can also serve as an indicator of potential impingement impacts. These data are presented for comparative analysis only and should not be considered as a conclusive impact analysis for impingement at Somerset.

TABLE 4-8

FISH IMPINGEMENT ESTIMATES FOR CAYUGA STATION

Species	Projected Impingement (1)(2) Collections	Percent (3)
Alewife	2,680,000	92.4
Rainbow smelt	104,000	3.6
Threespine stickleback	75,000	2.6
White perch	9,000	.3
Gizzard shad	6,000	.2
Emerald shiner	6,000	.2
Mottled sculpin	4,600	.16
White bass	4,400	.15
Spottail shiner	2,900	.10
Trout-perch	2,000	.07
Yellow perch	1,500	.05
Johnny darter	1,500	.05
Rock bass	900	.03

Each of the remaining fish species listed below was collected at NMP in numbers totalling less than .01 percent. Therefore, the applicant projects that each of these species may be impinged at rates ranging from 1 to 290 individuals per year.

Smallmouth bass	Walleye	Brook stickleback	Brook trout
Sea lamprey	Carp	Logperch	Chinook salmon
Lake chub	Cisco or lake herring	Channel catfish	Largemouth bass
White sucker	Coho salmon	Burbot	Rainbow trout
Brown bullhead	Golden shiner	Fathead minnow	Redfin shiner
Bluegill sunfish	Brown trout	Black crappie	Shorthead redhorse
Common shiner	Bluntnose minnow	Creek chub	Splake (hybrid lake trout)
Stonecat	Bowfin	Goldfish	Pearl dace
Freshwater drum	Gar	Longnose dace	Pirate perch
American eel	Brook silverside	Shiner	Sucker UID
Lake trout		Northern pike	
Mudminnow			
Pumpkinseed			

(1) These figures are based on three years (1973, 1974, and 1975) of impingement collections from Nine Mile Point station (NMP).

(2) The applicant's estimates were determined by assuming identical species composition (percentages) for Cayuga Station and Nine Mile Point. In addition, the applicant corrected for the lower flow volume (528 cfs) at Cayuga Station (Nine Mile Point has a flow volume of 557 cfs).

(3) Percentages (rounded off) of total numbers impinged at NMP.

TABLE 4-9

IMPINGEMENT OF GAME AND OTHER LARGE FISH AT GINNA NUCLEAR POWER PLANT, 1973

	Average Number of Fish per Day	Average Weight per Fish (oz)	Total Weight per Day (lb)	Total Number of Fish per Year	Total Weight per Year (lb)
White sucker	3.32	14.97	3.11	1,212	1,134
White perch	18.58	0.56	0.66	6,782	239
Gizzard shad	3.52	1.96	0.44	1,285	157
Rock bass	1.81	3.47	0.40	661	143
American eel	0.15	41.52	0.40	55	142
White bass	3.42	0.65	0.13	1,248	51
Cisco	0.05	33. 0	0.11	18	39
Black crappie	0.07	20.40	0.09	25	33
Smallmouth bass	0.80	1.58	0.09	292	29
Walleye	0.10	12.30	0.09	37	28
Yellow perch	0.30	3.25	0.07	110	22
Carp	0.08	10.82	0.07	29	20
American burbot	0.01	81.30	0.04	4	19
Goldfish	0.07	7.93	0.04	26	13
Pumpkinseed	0.46	0.10		168	1
Northern pike	0.05	0.08		18	1
Black bullhead	0.07	0.50		26	1
Freshwater drum	0.03	0. 5		11	1
Brown bullhead	0.05	0.35		18	0[a]
Total	32.94	2.60	5.74	12,023	2,072

[a]Calculated to be zero.

Source: Final EIS, Sterling Nuclear Unit 1, Nuclear Regulatory Commission.

TABLE 4-10

IMPINGEMENT OF ALEWIVES AND RAINBOW SMELT AT GINNA NUCLEAR POWER PLANT, 1973[a]

Species	Average Number of Fish per Day	Average Weight per Fish (oz)	Total Weight per Day (lb)	Total Number of Fish per Year	Total Weight per Year (lb)
(1) Alewife[b]	6,404.50	1.05	422.14	2,337,643	154,085
(2) Alewife[c]	1,047.98	1.05	69.07	382,513	25,213
(3) Alewife[d]	333.10	0.83	17.33	121,582	6,235
(4) Rainbow smelt	414.47	0.64	16.71	151,282	6,103
Total (1) + (4)	6,818.97		439.47	2,488,924	160,188
Total (2) + (4)	1,462.45		85.78	533,794	31,316
Total (3) + (4)	747.57		34.04	272,863	12,429

[a] All Ginna estimates based on thirty-nine 24-hr counts, January - December 1973.

[b] Including all data.

[c] Minus data of April 12-13.

[d] Minus data of April 12-13 and 26-27.

Source: Final EIS, Sterling Nuclear Unit 1, Nuclear Regulatory Commission.

TABLE 4-10 (Cont'd)

IMPINGEMENT OF FORAGE FISH AT
GINNA NUCLEAR POWER PLANT, 1973[a]

Species	Average Number of Fish per Day	Average Weight per Fish (oz)	Total Weight per Day (lb)	Total Number of Fish per Year	Total Weight per Year (lb)
Lake chub	24.33	0. 7	1.48	8,881	540
Spottail shiner	50.2	0.41	1.30	18,356	473
Three-spine stickleback	46.15	0.40	1.17	16,845	427
Sculpin	23.50	0.48	0.71	8,578	259
Crayfish [b]	16.20	0.19	0.20	5,913	72
Emerald shiner	5.60	0.31	0.11	2,044	39
Longnose dace	2.57	0.40	0.07	938	23
Trout perch	0.76	0.68	0.04	277	12
Lamprey	0.09	5.16	0.02	33	11
Common shiner	0.89	0.30	0.02	325	6
Johnny darter	0.67	0.38	0.02	244	6
Mooneye	0.26	0.40		95	2
Central mudminnow	0.03	0.28		11	0c
Total	171.34		5.14	62,539	1,860

[a] Does not include alewives and smelt.
[b] Additional organisms used as forage.
[c] Calculated to be zero.

Source: Final EIS, Sterling Nuclear Unit 1, Nuclear Regulatory Commission.

4.141
The State of New York has based its impingement analysis for Somerset on 1976 Ginna impingement data. Table 4-11 presents a comparison of the applicant's impingement estimates with the State's analysis. The estimates appear quite close except for alewife, which would be expected because of the applicant's "conservative" choice of impingement data (i.e., from Nine Mile Point). However, because Ginna is nearest the Somerset site, has the intake situated at about the 33-foot bottom contour and has an intake velocity of 0.8 fps, the State feels that Ginna impingement data may be more representative of the Somerset site than that from NMP.

4.142
Table 4-12 presents a comparison (made by the State of New York) of Somerset impingement to the total commercial catch of the United States in 1976 and the total lakewide commercial catch for 1976. The State's estimates of white perch and yellow perch impingement at the Somerset site represent 0.5 percent and 0.4 percent, respectively, of the U.S. commercial catch and would be .003 and .004 percent, respectively, of the total Lake Ontario commercial catch. An increased loss of this magnitude in Lake Ontario should have no discernible effects on the white perch and yellow perch commercial fishery in the United States or lakewide.

Since there is no commercial fishery for alewife and smelt commercial catches suffered a setback because of possible Mirex contamination, the State compared alewife and smelt impingement losses at Somerset with the 1976 population estimates made by the New York State Department of Environmental Conservation (DEC) (Schneider, 1977).

Species	Somerset Metric Tons	Schneider's New York Population Estimate Metric Tons	Percent of Population
Alewife	8.83	6,149.48	.14
Smelt	.97	397.44	.24

TABLE 4-11

SOMERSET ENTRAINMENT AND IMPINGEMENT LOSSES

Applicant							Hornibrook			
Impact	Species	Life Stage	Adult Equivalent	Metric Tons	Metric Tons	Adult Equivalent	Life Stage	Species	Impact
Entrainment(a)	Alewife	Larvae	256,364[c]	5.69	1.33	60,000c	Larvae	Alewife	Entrainment
Impingement(b)			2,710,363[c]	60.17	8.83				Impingement
Entrainment(a)	Rainbow Smelt	Eggs	10[c]	-	-		Eggs	Rainbow Smelt	Entrainment
		Larvae	3,300[c]	.07	3.54	159,000c	Larvae		
Impingement(b)			105,035[c]	2.33	.97				Impingement
				Total	Total				
			Alewife	65.86	10.16				
			Rainbow Smelt	2.40	4.51				

[a] Somerset 316(b) p. 3-61-S Entrainment Estimates.

[b] Somerset 316(b) p. 3-64-S Impingement Estimates.

[c] Weight taken from Schneider 1977 (22.2 grams).

TABLE 4-12

COMPARISONS OF 1976 ESTIMATE OF SOMERSET ENTRAINMENT*

Species	Somerset Impingement	U.S. Commercial Catch 1976	Percent of U.S. Catch	Total Lake Ontario 1976 Commercial Catch	Percent of Lake Catch
Alewife	8.83	-			
Gizzard Shad	.12	-			
Rainbow Smelt	.97	5.43	17.86	46.71	2.08
White Perch	.01	20.41	.05	351.08	.003
Yellow Perch	.01	24.04	.04	284.40	.004

* In Metric Tons.

4.142a
In order to assess the potential level of cumulative impact of the proposed station, the following analysis was performed for two species, alewife and rainbow smelt, for which population estimates exist.

The impingement records from existing stations were first considered. A complete series of estimates for the years 1973 through 1976 were available for Nine Mile Point, but for no other station. In order to create a complete series of annual estimates, the missing years of data at a given station are estimated by the mean of the impingement during the years for which data are available. These data points are marked with an asterisk (*) in the following tables. Impingement estimates were made for the Somerset Site based on the Nine Mile Point impingement records so as to be conservative, since the Nine Mile Point impingement estimates are, in most cases, higher than the impingement at other stations.

The predicted impingement at the proposed Sterling power plant was added to the estimated impingement using the higher of two estimates made in the Sterling Final Environmental Statement. The estimated impingement of Lake Ontario fishes, exclusive of Canadian plants, is, therefore, as follows:

Annual Impingement Estimate for Lake Ontario

Station	1973	1974	1975	1976
Nine Mile Point	5,441,274	2,748,481	1,095,461	3,436,085
Oswego Units 1-4	362,859*	362,859*	362,859	362,859
Ginna	2,480,800	2,545,000	2,512,900*	2,512,900*
Fitzpatrick	806,449*	806,449*	806,449*	806,449
Somerset Estimate	5,158,328	2,605,560	1,035,497	3,257,409
Sterling Estimate	5,370,000	5,370,000	5,370,000	5,370,000
Total	19,619,710	14,438,349	11,183,166	15,745,702

The predominant species impinged at the operating power plants in the above table are alewife and rainbow smelt. Examination of the actual impingement data from operating plants for 1973 through 1976

indicates that the percent of the total impingement of these two species varies from year to year as follows:

Percent of the Total Impingement (Weighted Average)

Species	1973	1974	1975	1976
Alewife	94.8	92.8	79.8	90.1
Rainbow Smelt	3.7	4.0	7.9	4.0

Using these percentage values, one can arrive at a total number of alewives and rainbow smelt estimated to be lost each year to impingement at existing and proposed U.S. power plants.

Species	1973	1974	1975	1976
Alewife Lost	18,599,485	13,398,788	8,924,166	14,186,878
Rainbow Smelt Lost	725,929	577,534	883,470	629,828

Addition of Canadian alewife and rainbow smelt impingement data to these numbers requires some manipulation as such data are submitted as kilograms of fish lost and gizzard shad are often combined with alewife for a single weight.

The following weights of impinged fish are available:

Kilograms Impinged

Station	Alewife & Gizzard Shad		Rainbow Smelt	
	1975	1976	1975	1976
Hearn	19,007	11,694.7	964	740
Lakeview	34,615(a)	1,731.1	-	80
Lennox	(b)	586.4	(b)	204.7
	53,622	14,012.2	964	1,024.7

(a) All species (will be treated as alewife)
(b) Insufficient data

Projection of the average weight from the available years will serve to complete the 1973 through 1976 series of estimates. Conversion of the weights to the number of fish lost based on an average weight per fish then allows addition of the Canadian data to the U.S. data. The average weight assumed for the alewife is 15.92 grams/fish and for the rainbow smelt is 29.44 grams/fish based on the applicant's catch data. The final Lake Ontario impingement estimates are thus as follows:

Alewife Impingement

	1973	1974	1975	1976
Canadian	2,124,190*	2,124,190*	3,368,216	880,163
U.S.	18,599,485	13,398,788	8,924,166	14,186,878
Total	20,723,675	15,522,978	12,292,382	15,067,041

Rainbow Smelt Impingement

	1973	1974	1975	1976
Canadian	33,775*	33,775*	32,745	34,806
U.S.	725,929	577,534	883,470	629,828
Total	759,704	611,309	916,215	664,634

Comparison of these total annual impingement estimates to the estimated population sizes for these two species in the lake allows one to establish the magnitude of the lakewide impact and to make a judgement as to its severity or lack thereof. Population estimates have been made by the Great Lakes Fisheries Laboratory, Ann Arbor, Michigan as follows:

Population Estimates

Estimate	Alewife	Rainbow Smelt
Mean	1,036,032,000	969,609,200
Minimum	309,350,400	323,066,880
Maximum	3,440,793,600	1,472,040,900

Calculations of the percent of the population impacted by impingement yields the following array of values:

Percent of Alewife Population Lost

Population Estimate	1973	1974	1975	1976
Mean	2.00	1.50	1.19	1.45
Minimum	6.70	5.02	3.97	4.87
Maximum	0.60	0.45	0.36	0.44

Percent of Rainbow Smelt Population Lost

Population Estimate	1973	1974	1975	1976
Mean	0.08	0.06	0.09	0.07
Minimum	0.24	0.19	0.28	0.21
Maximum	0.05	0.04	0.06	0.05

These percentages are indicative of the very low combined impact on these fish populations resulting from impingement at power plants on the lake.

There is no reason to assume that any other species would suffer losses greatly over the percentages demonstrated here in that their abundance in impingement records is much lower than that exhibited by the two species discussed here and the intake has been designed and located so as to avoid known fish concentrations or habitats. Estimation of cumulative impacts on ichthyoplankton, zooplankton, benthos, and phytoplankton populations is not possible due to insufficient lakewide data and the paucity of entrainment data at operating power plants.

4.143
Because impingement is only one of two potential impacts, the following table presents the total impact of entrainment and impingement by the Somerset facility on the above alewife and smelt population estimates, as predicted by the State of New York.

Species	Somerset	Metric Tons	Schneider Population	Percent of Population
Alewife	Entrainment	1.33		
	Impingement	8.83		
	Total	10.16	6,149.48	.17
Smelt	Entrainment	3.54		
	Impingement	.97		
	Total	4.51	397.44	1.13

4.144
The Somerset facility may be equipped with bucket-type screens, two-stage wash and a fish return. Based on the success of such a system at the Surry plant, and the conservative estimate of 85 percent efficiency for returning fish alive at the Somerset facility, it is conceivable that the Somerset facility could cause losses as low as .03 percent to alewife and .16 percent to smelt. An alternative method is the use of a screened intake system such as Johnson screens or equivalent.

Intake Entrainment

4.145
Certain small organisms such as phytoplankton, zooplankton, fish eggs, larvae, and juvenile fish will be entrained into the cooling system of the facility where they will be subjected to thermal, mechanical, and pressure stresses. Due to the weak swimming abilities of these small organisms, the number taken into the plant varies directly with the volume of intake water, the density of planktonic organisms in that water, the spatial distribution of organisms, and prevailing currents in the area.

4.146
Damage to entrained organisms depends upon such factors as change in temperature, acclimation temperature, thermal tolerance limits of the species involved, time of exposure, and mechanical, pressure, and biocide stresses during entrainment (biocide use, however, is not anticipated at the proposed facility). The total travel time in the proposed system from the intake structures to the diffuser discharge will be nine minutes and 50 seconds, of which four minutes and 45 seconds will elapse before condenser passage. The duration of exposure to the elevated temperature, commencing with condenser passage and continuing until the organisms are discharged through one of the

nine diffuser ports, will extend for approximately five minutes. Table 4-5 shows the amount of time, based on centerline plume velocities, that planktonic organisms would expect to spend at elevated temperatures within the discharge plume.

4.147
Since data from operating stations generally indicate high percentage losses due to entrainment for ichthyoplankton, and because the high ΔT selected for this facility will increase the probability of high losses, the assessment of losses used in estimating impact assume that organisms undergoing plant passage will suffer 100 percent mortality. However, some references suggest that there is perhaps a chance that some organisms will survive (Talling, 1972; Kreuger, 1975 and others).

4.148
Phytoplankton suffering mortality or depression of photosynthetic activity as a result of entrainment may still serve as a food source to other trophic levels. The effect on the ecosystem will be negligible, as the short generation times of phytoplankton allow for rapid replacement of entrained cells (Talling, 1972; Mihursky, 1969).

4.149
The impact to the ecosystem due to the loss of the entrained zooplankton depends not only upon the percent of entrained organisms killed, but upon the percent of the water body (and therefore of the plankton population) entrained, the uniqueness of the portion of the population entrained, and the ability of that population to reproduce. Growth and reproductive rates for zooplankton are generally highest in the summer when the effects of entrainment and thermal discharges are the most severe. Thermal discharge may enhance reproduction in winter in the discharge area.

4.150
Most studies of the effects of loss of plankton organisms from plant entrainment on phytoplankton and zooplankton populations indicate that the effect is highly localized. Studies have shown that phytoplankton populations are rapidly replaced by reproduction which can proceed at one to three cell divisions per day (Talling, 1972). Zooplankton species will be replaced somewhat less rapidly. Studies on the Patuxent River concluded that zooplankton losses due to condenser passages during the warmer months (when zooplankton losses are highest) were replaced in five days because of the high reproductive rates at this time (Mihursky, 1969).

4.151
Entrainment of ichthyoplankton has the potential for triggering the greatest effects on aquatic ecosystems as a whole. This is due to

the annual reproduction mode of these organisms and their correspondingly longer generation times as well as their capacity to exploit other food chain organisms selectively and to cause shifts in community composition which may favor given species based on their food chain specificity and capacity for increase.

Entrainment Estimates

4.152
Estimates of the total number of Planktonic organisms (phytoplankton, zooplankton) entrained in the cooling system each month were generated by multiplying a monthly mean of the number of organisms per cubic meter of water at the surface and 25 feet below the surface by the volume of water entrained in the cooling system during the corresponding month.

4.153
Phytoplankton entrainment estimates are based upon bottle samples at all stations for each month. Zooplankton estimates are based on Clarke-Bumpus samples for rotifers, cladocerans, and copepods at all stations each month. Ichthyoplankton samples are based on stratified tows perpendicular to shore at all stations. Depth samples at 50 feet were not used in these estimates because the intake will not withdraw water from that location, which is a distance of 2,000 feet further offshore. Estimates of phytoplankton entrainment predict that losses will range from a low in December of 9.95×10^{12} cells per month to a high in May of 1.15×10^{14} cells per month. Estimates of net zooplankton entrainment predict that losses will range from a low in December of 2.33×10^{9} organisms per month to a high in August of 6.33×10^{11} organisms per month.

4.154
Nine taxa were represented in the 1974 ichthyoplankton collections. Rainbow smelt accounted for over five percent of the annual fish egg catch, all having been caught in May. Carp comprised nearly 20 percent of the catch while the remaining eggs or egg shells were unidentifiable. Alewife (87.8 percent of the total catch) was the most abundant species of larvae found at the site. Alewife spawning extended from late May through early August, with peak activity occurring during July. Alewife larvae were generally most abundant at the surface in June and July. Later they became more abundant at the 25-foot depth in water 25 to 65 feet deep. Smelt (3.8 percent of the total larvae catch) were found to spawn from April through May and reach peak larval densities in June. Although white perch and yellow perch larvae were also identified, they accounted for only 0.4 percent of the total annual catch. Others collected include sunfish, shiners, carp, and several unidentified species, all of which were caught in insignificant numbers.

4.155
Entrainment of fish eggs, larvae and young fish results in near 100 percent mortality in most cases (Marcy, 1975). The range of mortality cited by this author in several studies is 39 to 100 percent. U.S. EPA (1976) indicates that 80 percent of fish going through power plants with once-through cooling are killed by abrasion, turbulence, shock, and other mechanical effects while the other 20 percent are killed by the high temperature. Therefore, estimates of impact due to entrainment of the ichthyoplankton should assume that all entrained organisms are lost to the population.

Consequently, the applicant determined that ichthyoplankton losses due to entrainment would be directly proportional to the density of ichthyoplankton and the volume of water withdrawn. Density estimates were based on the average number of ichthyoplankton sampled along transects that approximate the zone from which water will be withdrawn. As previously noted, alewife and rainbow smelt are the most abundant ichthyoplankton and will therefore sustain the heaviest losses. Table 4-13 summarizes annual ichthyoplankton losses.

4.156
In order to assess what these losses will mean to the Lake Ontario populations of these species, a conversion was made from the number of each stage lost (by entrainment) to the number of adults which might have resulted from these ichthyoplankton had they not been entrained. Horst (75) suggests a method for calculating loss to adult populations from egg and larval mortalities based on fecundity data. This method was employed and the results are also included on Table 4-13.

Table 4-13

ESTIMATED ANNUAL ICHTHYOPLANKTON LOSSES AND EQUIVALENT ADULT LOSSES FOR SOMERSET

Species	Annual Icthyoplankton Losses	Converted to Adult Losses[a]
Alewife larvae	1.41×10^7	256,364
Rainbow Smelt		
Eggs	1.93×10^5	10
Larvae	6.60×10^5	3,300
Sunfish sp. Larvae	8.92×10^3	9
Yellow Perch Larvae	1.42×10^5	123
Unidentified (treated as alewife)		
Eggs	5.38×10^5	98
Larvae	1.01×10^6	18,364
Others (treated as Carp):		
Eggs	4.46×10^4	1
Larvae	4.94×10^4	10

[a] Fecundity and survival rates required for conversion were taken from the literature (Breder, and Rosen, 1966; Carlander, 1969: and Rupp, 1965).

4.157
Estimates on the standing stock of rainbow smelt and alewife for Lake Ontario have been made by the Great Lakes Fishery Laboratory, Ann Arbor, Michigan. The potential effect of the combined impact of entrainment and impingement on the Lake Ontario population by the proposed facility has been estimated by the applicant, and the resulting range of values and percent of estimated stock impacted are:

	Alewife	Rainbow Smelt
Number Entrained	256,364	3,310
Number Impinged	2,710,363	105,035
Total	2,966,727	108,345
Population Estimate (Mean)	1,036.032,000	969,609,200
Percent Impacted	0.29%	0.01%
Population Estimate (Minimum)	309,350,000	323,066,880
Percent Impacted	0.96%	0.03%
Population Estimate (Maximum)	3,440,793,600	1,472,040,900
Percent Impacted	0.09%	0.007%

4.158
The State analysis of ichthyoplankton concentrations and the impact of entrainment varies slightly from the applicant's study. This variance is acceptable to Corps staff. The following assumptions were used by the State to calculate entrainment losses:

- The ichthyoplankton samples taken were representative of an instantaneous ichthyoplankton density that occurred at each discrete depth of the water column.

- Night sample concentrations are twice as great as densities found in day samples at that sampling station.

- Diel-vertical migrations exist.

- Bottom samples taken at the 30-foot and 50-foot contours and mid-depth samples at the 50-foot contour for 1975 and 1977 are representative of the number of organisms per 100 m^3 of water that would be entrained by an intake at each of these locations. The samples were considered to represent day or night concentrations in proportion to daylight hours in the spring and summer (14 hours daylight).

- The number of available organisms was considered to be the number calculated for the cross-section along the transect of the proposed intake from the shoreline to 600 feet past the 50-foot contour times the distance along the shoreline of two miles.

By utilizing the 1975 and May-June 1977 ichthyoplankton densities, the State calculated the number of larvae of alewife, carp, rainbow smelt, white perch, clupeidae, and unidentified species that would be entrained. Estimates have been derived from data collected at the 30- and 50-foot bottom contour and the 50-foot mid-depth. Table 4-14 shows the percent withdrawal of each species from the estimated total number available per species.

4.158a
Ichthyoplankton entering the plant will pass through the intake screening devices in the pumphouse due to their small size, will readily pass through the pumps and condenser and will be discharged from the diffusers. Since the intake has been located in such a way as to avoid major habitats of the ichthyoplankton life stage, the percent of the fish eggs and larvae available in the site area which will be entrained will be small. In addition, these organisms are very small and their biomass, of itself, would not contribute significantly to the food supply. It should be emphasized that the organisms are not removed permanently from the lake but are returned to

TABLE 4-14

SOMERSET ENTRAINMENT
PERCENT WITHDRAWN OF AVAILABLE (2 MILE) POPULATION

Species	1974					1977				
	30-Foot Bottom		50-Foot Bottom	50-Foot Mid-Depth		30-Foot Bottom		50-Foot Bottom	50-Foot Mid-Depth	
	Seasonal Percent	Total Number	Seasonal Percent	Seasonal Percent		Seasonal Percent	Total Number	Seasonal Percent	Seasonal Percent	
Alewife	-	-	-	-	Eggs	0	0	0	0	
	1.08	8,889,000	0.50	1.53	Larvae	0.81	40,606,800	0.21	0.26	
Rainbow Smelt	-	-	-	-	Eggs	-	-	-	-	
	2.82	2,259,000	1.93	3.07	Larvae	2.34	13,995,000	2.33	1.68	
Morone (White Perch)	-	-	-	-	Eggs	-	-	-	-	
	14.45	853,000	0	0	Larvae	0	0	0	0	
Yellow Perch	-	-	-	-	Eggs	-	-	-	-	
	0	0	0	0	Larvae	-	-	-	-	
Carp	-	-	-	-	Eggs	-	-	-	-	
	-	-	-	-	Larvae	13.86	9,781,200	0	0	
Clupeidae	-	-	-	-	Eggs	-	-	-	-	
	-	-	-	-	Larvae	.65	279,000	-	-	
Notropis	-	-	-	-	Eggs	-	-	-	-	
	-	-	-	-	Larvae	0	0	43.91	0	
Freshwater Drum	-	-	-	-	Eggs	5.63	1,310,000	1.20	0	
	-	-	-	-	Larvae	-	-	-	-	
Unidentified	-	-	-	-	Eggs	-	-	-	-	
	-	-	-	-	Larvae	0	0	2.80	4.41	

the lake where they will again be available to their predators as food. However, entrainment mortality will be virtually 100 percent and dead ichthyoplankton may not be acceptable as food by those organisms that consume live ichthyoplankton. Other consumers adapted to utilize dead ichthyoplankton may increase in the area of the discharge structure, but this change in community structure is expected to be insignificant. The ichthyoplankton themselves will be eliminated from their position as future consumers in the food chain but the increase, if any, of their prey or forage species is expected to be insignificant.

The applicant has agreed to the installation of a fish return system which will return most of the fish impinged in the intake screens to the lake unharmed. Upon reentering the lake, the fish will continue to function in the ecosystem as both prey and/or predator. Thus, impact to the Lake Ontario food chain is predicted to be minimal as insignificant biomass is being lost to the ecosystem.

Major Changes in Local Current Patterns or Water Movement

4.159
The major current patterns at the site are alongshore in a west to east direction with reversals to an east to west direction. Construction and operation of the power plant will not alter this basic pattern as discussed in the previous section ("Physical Impacts"). Some highly localized changes in currents from the present condition can be expected in the areas of the intake and discharge structures. These current changes may result in some changes in population distributions primarily due to the formation of quiet water areas in the lee of the proposed structures. These quiet areas will be restricted to the immediate region of the intake and discharge pipes, and it is expected that some organisms, primarily fish, will shelter in this zone. However, as the ambient current velocities in this area of Lake Ontario are low, no appreciable population shifts are anticipated, nor will these minor changes in distribution significantly alter the potential for impingement or entrainment. The discharge is expected to induce local rotary currents. These currents will result in some displacement of plankton forms from the discharge zone offshore and in the transport of offshore organisms inshore with the replacement water. Due to the relatively homogeneous plankton population in the Somerset area, these movements of organisms are not expected to result in any adverse change in the plankton distributions.

4.160
Changes in current patterns in the vicinity of the site induced by construction or operation are not expected to serve as a barrier to normal migrations or movements of any species. The placement of the

intake and discharge structures offshore provides a zone of passage for any species which utilized the shoreline or inshore area for migrations or spawning runs.

Dissolved Oxygen

4.161
No change in dissolved oxygen content is anticipated as a result of facility operation. Cooling water may be expected to become supersaturated with oxygen during plant passage due to a decrease in O_2 solubility induced by thermal addition. Rapid mixing in the plume and subsequent cooling are expected to return O_2 saturation values to ambient levels.

Scheduled or Unscheduled Shutdown

4.162
Shutdowns for routine maintenance are scheduled for the warm weather months (April to October). The loss of a zone of elevated temperature is not expected to adversely affect the aquatic biota during this period of relatively warm ambient temperatures. Unscheduled shutdowns during these months will also not adversely affect the aquatic biota.

4.163
Unscheduled shutdowns during the cold months (November to March) are not expected to result in any significant losses of aquatic biota. Cold shock results when organisms acclimate to much higher than ambient temperature by residing in the plume, and are then forced by plant stoppage or other factors to return rapidly to the colder ambient condition. All of the diffuser design factors should prevent acclimation to significantly higher temperatures and thereby prevent cold shock. Lower lethal threshold temperatures for a number of species found in Lake Ontario indicate that the smallest change in temperature which the most sensitive species could endure would be slightly greater than a 4°C (7.2°F) reduction when the acclimation temperatures is 5°C (41°F). While the discharge Δ T designed for the proposed facility will obviously not, of itself, protect against cold shock, the high discharge current velocities and rapid dilution will reduce the plume temperature to a safe level while still excluding most fish. The current velocity profile (Table 4.5) predicted in the discharge plume will readily exclude most fish from occupying areas or becoming acclimated to temperatures exceeding 7°F above ambient. At this point, the current velocity will still be three fps. Very few fish species can maintain swimming speeds over two to three fps, especially in the winter, for the several days required to change the acclimation temperature of the fish involved (Brett, 1952).

Therefore, the plume velocity will exclude fish from the higher temperature and prevent their acclimating to an elevated temperature which might result in cold shock upon return to ambient lake water temperatures.

4.164
Exposure to the plume, due to plume dilution water entrainment, will result in only very short times at higher temperatures. These times are insufficient in length to attain acclimation, and as a result these organisms will not be adversely affected by scheduled or unscheduled shutdowns. Corps staff agrees that fish residence in the highest area of the plume is unlikely due to the high discharge velocity. Staff also believes that any losses due to emergency shutdown will be low and should not affect the local or lakewide high populations. However, at times of the year when ambient temperatures are close to freezing, staff believes that the effects of sudden temperature drops may be lethal to some fish species (Goodyear, et al., 1975). Studies by Speakman, et al., 1971, indicate that rate of temperature change during cold shock is more critical than during heat shock.

IMPACT OF CHEMICAL, BIOCIDAL, AND SANITARY WASTE DISCHARGES

4.165
The collection, treatment, and disposal of station liquid wastes will produce no significant impact on lake water quality. The treatment operations discussed in Chapter One will reduce the quantity and concentration of materials in wastes to such levels that the resultant discharge will be in compliance with EPA effluent requirements pursuant to Section 306 of the Federal Water Pollution Control Act. Table 4-15 presents a summary of effluent limitations guidelines and standards for pollutants other than heat as compiled from 40 CFR 423. New York State has not published effluent limitations.

4.166
In-station reuse (recycling) of the treated liquid waste effluent will minimize the quantity of materials ultimately discharged. During periods of discharge, the treated effluent will be mixed with the cooling water discharge prior to entering the lake. Treated liquid waste characteristics prior to combination with the cooling water discharge are presented in Chapter One, Table 1-13. Since cooling water withdrawn from the lake will constitute over 99.9 percent of the total average effluent flow from the station, the addition of treated liquid wastes will not significantly alter ambient lake parameter concentrations. The combined station discharge is thus expected to be in compliance with New York State surface water quality standards for the lake, as given in Table 4-16, at the point of discharge to the lake provided that the ambient lake water

TABLE 4-15

SUMMARY EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR POLLUTANTS OTHER THAN HEAT
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Source	Pollutants	Effluent Limitation (Waste Flow X Concentration = Allowable Discharge) Maximum Concentration	Average Concentration
Bottom Ash Transport Water	Total Suspended Solids	(Flow x Conc. ÷ 20)	(Flow x Conc. ÷ 20)
	Oil and Grease	100 mg/l	30 mg/l
		20 mg/l	15 mg/l
Fly Ash Transport Water	Total Suspended Solids	No Discharge	No Discharge
	Oil and Grease		
Metal Cleaning Wastes	Total Suspended Solids	100 mg/l	30 mg/l
	Oil and Grease	20 mg/l	15 mg/l
	Copper, Total	1.0 mg/l	1.0 mg/l
	Iron, Total	1.0 mg/l	1.0 mg/l
Boiler Blowdown	Total Suspended Solids	100 mg/l	30 mg/l
	Oil and Grease	20 mg/l	15 mg/l
	Copper, Total	1.0 mg/l	1.0 mg/l
	Iron, Total	1.0 mg/l	1.0 mg/l
Low-volume waste sources taken collectively, as if from one source	Total Suspended Solids	100 mg/l	30 mg/l
	Oil and Grease	20 mg/l	15 mg/l
Rainfall runoff from material storage areas (such as coal, ash or other material storage pile) and from Construction Activities	Total Suspended Solids	50 mg/l	———
Once-through Cooling Water	Free Available Chlorine	0.5 mg/l	0.2 mg/l

The pH of all discharges, except once-through cooling water, shall be within the range of 6.0 to 9.0 There shall be no discharge of Polychlorinated Biphenyl (PCB) compounds.
Free available chlorine and total residual chlorine may not be discharged from any unit for more than two hours in any one day or from more than one unit of the same time.
Maximum allowable concentration is for any one day. Average concentration refers to the average of daily values for 30 consecutive days.

withdrawn as cooling water satisfies these standards. Present ambient lake water quality is presented in Chapter Two, "Present Water Quality."

Destruction of aquatic organisms in the cooling water system may increase the organic detrital load in the discharge area. This detritus will be available for grazing by zooplankton, ichthyoplankton, and forage fish as well as benthic organisms. It will also have an oxygen demand.

4.167
The impact of waste facilities and discharges on groundwater will be minimal. There will be no direct discharges of liquid waste into the groundwater. The coal pile will be constructed upon an impermeable surface to preclude groundwater interaction or seepage of coal pile leachate into the groundwater. Liquid waste treatment facilities will be constructed of leakproof materials.

4.168
As required by Title 40, Code of Federal Regulations, Part 112, a Spill Prevention Control and Countermeasure Plan (SPCC) will be developed and made easily accessible to station operating personnel to prevent oil (or chemicals) from entering the lake. All oil or chemical spills from storage tanks will be contained in diked areas around each tank, and will be manually removed or recovered without allowing contamination of the terrestrial and aquatic environments.

TABLE 4-16

LAKE ONTARIO SURFACE WATER QUALITY STANDARDS
(6 NYCCR, 702.1)

	Lake Ontario Concentrations (mg/l except pH)
pH (units)	6.7 - 8.5
TDS	200
DO	6.0
Iron	0.3
Ammonia or Ammonia Compounds	2.0
Cyanide	0.1
Ferro- or Ferricyanide	0.4
Copper	0.2
Zinc	0.3
Cadmium	0.3

IMPACT OF SOLID WASTE DISPOSAL OPERATIONS

4.169
The various types of solid waste generated by the proposed station are discussed in Chapter One. Wastes having the most significant impacts are stabilized FGD sludge, fly ash, bottom ash, and pyrites. A total of approximately 537,100 tons (dry weight) of stabilized FGD sludge, fly ash, and bottom ash will be produced annually. Impacts and mitigative measures associated with the disposal of these substances are discussed below.

4.170
Preparation of the onsite disposal area will require the clearance of 270 acres and will consequently preempt 131 acres of open fields, 139 acres of cropland, five acres of residential area, and four acres of deserted orchard and fence row. It should be noted that of the 270 acres cleared, only 218 acres and 10 acres will be filled with stabilized FGD sludge/ash and pyrites, respectively. This area provides excellent habitat for many animal species, especially Canada goose and ring-neck pheasant.

4.171
Onsite stabilized FGD sludge/ash disposal will affect both faunal and vegetative communities. The distribution, species composition, and productivity of vegetative communities not directly removed may be influenced by clearing of the disposal site, deposition of fugitive dust, and changes in the water quality or hydrology of surface and ground water. Fauna will be influenced by the change in or loss of vegetation types and by the barriers to travel created by the berms, stabilized FGD sludge/ash piles, and ditches. Since disposal is on-site, transportation impacts such as dust, noise, and road kills would be reduced.

4.172
A coating of dust could possibly affect vegetation by interfering with photosynthesis or respiration. If any damage occurs, it is likely to be confined to the immediate area of the disposal site, the fly ash storage silos FGD sludge stabilization facility, and the truck route connecting them.

4.173
If water discharged from the solid waste disposal area were contaminated as a result of the storage of stabilized FGD sludge/ash on the site, plant communities using contaminated water could experience death or changes in growth rate, or could concentrate toxic elements which are passed on through the food chain. Faunal communities drinking the water or feeding on affected plants or aquatic organisms (e.g., fish or invertebrates) could experience death, changes in health, changes in reproductive capacity, or could further concentrate toxic elements which are passed on through the food chain. Runoff from the proposed disposal areas will be collected, monitored, and treated as necessary to meet State and Federal discharge standards.

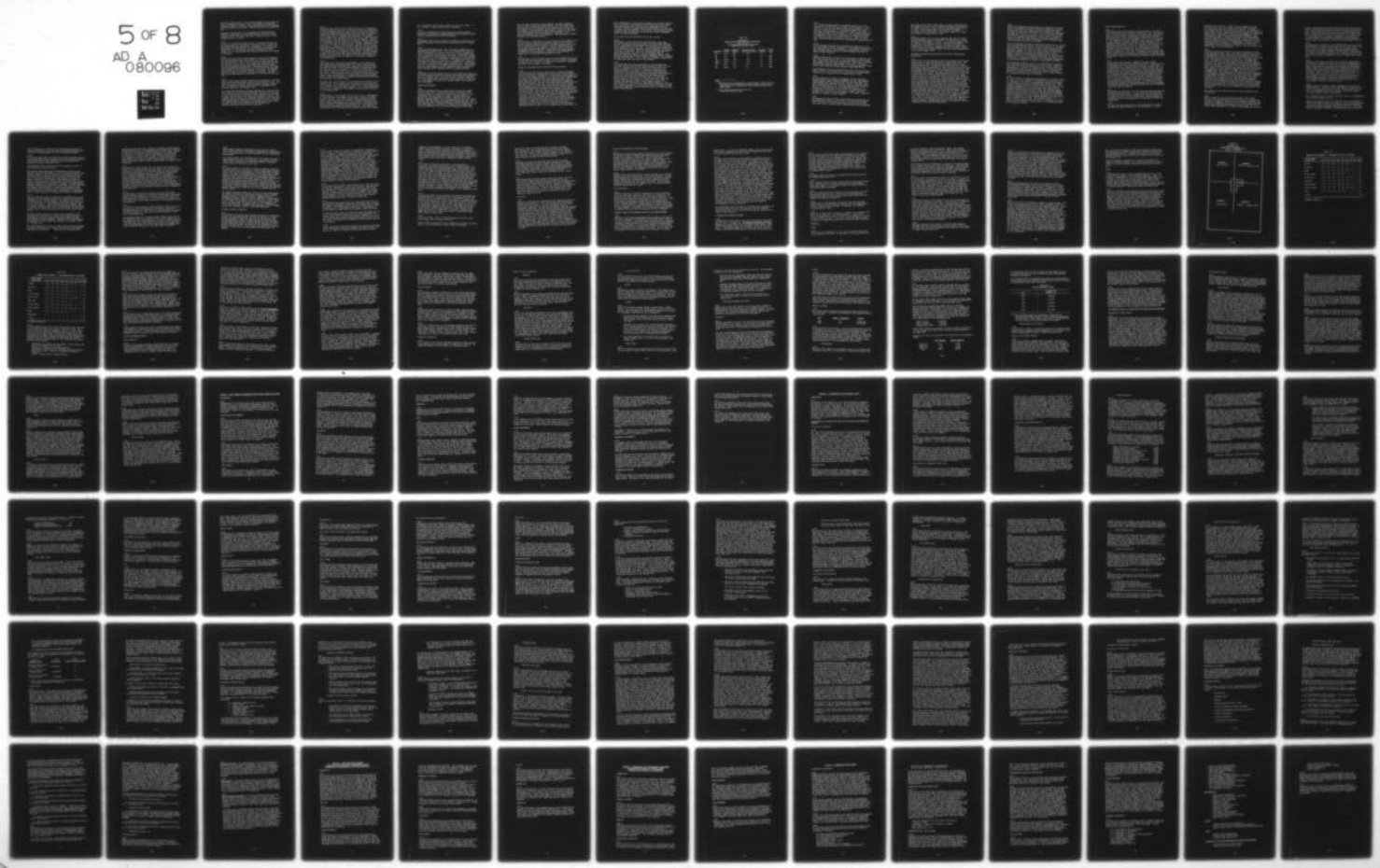
4.174
The effect of the disposal of stabilized FGD sludge on water discharged from the disposal area is expected to be minimal with no adverse impact on the surrounding aquatic and terrestrial habitat. The stabilization process will chemically bind the sludge constituents within the stabilized sludge. The stabilization process and landfill procedure will also render the sludge essentially impermeable. Therefore, the availability of sludge constituents to leaching is minimized and limited to the outermost surface of the fill. No leachate production is expected.

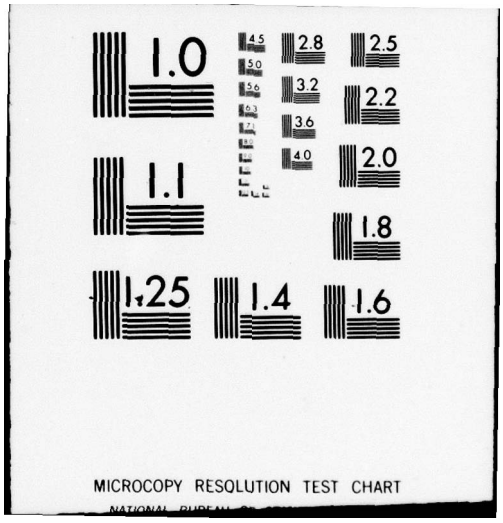
The pH and hardness of water coming into contact with the stabilized sludge will typically be somewhat higher than if only ash were being disposed. The increase in pH will reduce the solubility of heavy metals in the ash, thus limiting the leaching which might occur

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DEC 78 A K MARKS, P G LEUCHNER, R S ROTHMAN

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MICROCOPY RESOLUTION TEST CHART

following rainfall contact. The elevated hardness of the runoff will serve to precipitate the metal ions. The exposure of stabilized sludge to rainfall is limited, as only small portions of the disposal area will be active at one time. Inactive areas will be covered with soil.

Treatment of runoff will be in conformance with Federal Effluent Guidelines and Standards for the Steam Electric Power Point Source Category (40 CFR 423) which limit pH to a range of 6.0 to 9.0 and suspended solids to 50 mg/l.

4.175
Pyrite is an iron sulfide found in coal. In contact with water it can form an iron-rich acid leachate that would violate surface and groundwater discharge limitations. Consequently, its disposal must be given special consideration. Pyrite disposal was discussed in Chapter One. If data indicate that pyrite sedimentation pond overflow is not in compliance with standards, provision for treatment will be made.

4.176
The New York State Office of Environmental Planning has recommended that the spring high water table should not be within five feet of the ash and 10 feet of the pyrites if any part of the disposal area is not protected by a liner. The pervious soil underlying the site will require the installation of an impermeable liner to prevent potential groundwater contamination. With an FGD system, the stabilized sludge will effectively serve as a liner due to the negligible permeability and the anticipated absence of leachate. The groundwater flows under the disposal area into Lake Ontario. No water wells are located adjacent to Lake Ontario in the disposal site vicinity.

4.177
Present surface water drainage patterns will be modified at the disposal site by diverting water around the active disposal areas. Some areas will receive increased flow while others will have reduced flow. The quality of surface water runoff and groundwater may be adversely affected by the disposal site.

Fish Creek flows through the proposed disposal area on the site and will ultimately have stabilized sludge/ash landfills on either side. It will be protected by a berm and a buffer area and is not expected to suffer adverse impacts from stabilized sludge/ash disposal. The unnamed creek and pond will be similarly protected. Two of the sedimentation ponds will eventually flow into Fish Creek but no significant adverse effects are expected. The applicant will treat runoff to comply with New York Standards (pH 6-9, TSS 0-50 mg/l). Additional information may be found in Appendix F.

4.178
Wind-borne dust eroded from the exposed surfaces of the stabilized sludge/ash disposal piles can be a potential source of contamination to the surrounding ecosystem. Due to the initially moist nature of stabilized sludge and the hardening effect as it ages, the amount of fugitive dust from the disposal site is expected to be minimal. Since concentrations of fugitive dust will be low, no adverse effects of potentially toxic elements from the dust are expected. Fugitive dust may have a potential impact on air quality. However, the vents to the pneumatic fly ash system will be connected to bag dust filters or to the inlet side of the precipitator, thereby eliminating dust generation. In addition, the fly ash storage silos will be equipped with dustless unloaders which use water to prevent spillage and the formation of dust. Bottom ash and fresh stabilized sludge will contain sufficient water to preclude a dust problem. Any small amounts of dust which may be generated would normally be deposited in close proximity to the source. The impact of the dust on settleable particulate (dustfall) levels is expected to be primarily confined to the disposal site.

4.179
Noise impacts will be increased predominantly by the operation of stabilized sludge handling equipment at the onsite disposal area. Four residences will experience L_{50} levels above the New York State DEC limit of 55 dBA. At the closest residence, approximately 300 feet from the fill area perimeter, the L_{50} and L_{eq} noise levels will reach a maximum of about 62 for a few months during the life of the station. Some annoyance could be anticipated at the nearby residences. Onsite transportation of Cayuga Station stabilized sludge will not impact any residences. Disposal activities will occur seven hours per day, five days per week.

The above noise levels would not be continuous during the life of the disposal site. It is estimated that the property line noise levels could approach these values about 25 percent of the time during seven to nine years of the ash disposal sequence (i.e., the DEC regulations will only be exceeded when the equipment is working within 750 feet of the property line).

4.180
Transportation to the disposal site will be by truck. Approximately 14 truck loads per hour (seven hours per day, five days per week) would be required. This traffic would increase exhaust emissions. However, all trucks used will conform to applicable emission standards, thereby minimizing the air quality impact. Stabilized sludge and ash blowing and leakage during transport will be controlled by moisture and by appropriately designed vehicles. The proximity of the disposal site to the station will determine whether this moisture

will sufficiently control these problems to allow open trucks. If not, covered or closed vehicles would be employed.

4.181
The onsite transportation of waste eliminates offsite trucking. Therefore, no increase in road maintenance cost or decrease in road safety is associated with onsite ash disposal.

4.182
The proposed fill area will require the removal of a portion of the Huldah Bush property discussed under Cultural Resources in Chapter Two.

4.183
The total annual agricultural value of the whole disposal site is approximately $126,000 (1977). The loss of this agricultural land will be incremental over 30 years and will not have a significant effect on the total productivity of the area. Screening and revegetation programs will help mitigate the impact of this land clearing and, together with fill landscaping, an aesthetically pleasing landform will exist upon site completion. The disposal site is in an area zoned for agricultural use and also designated as a commercial, residential, and institutional growth potential area. Additionally, the area is included in a Statewide recreational plan. Since final plans for these programs are not completed or under construction, these land uses can be compatible with the proposed facility.

4.184
Development of the ash disposal site will not require the removal of the nine existing residences (31 people) located along the boundaries of the ash disposal site. The plant presently owns and leases all but one of these parcels and does not plan to purchase the remaining one. Approximately 200 people are located within a mile radius of the site boundary.

IMPACT ON AIR QUALITY

4.185
Effluents released from the proposed facility stack will include sulfur dioxide (SO_2), nitrogen oxides (NO_x), particulates (TSP), and small amounts of various other gases and trace elements. The contaminants are also present in various concentrations in the ambient air of the Somerset site region. National Ambient Air Quality Standards (NAAQS) have been promulgated for SO_2, TSP, carbon monoxide (CO), ozone (O_3), and nonmethane hydrocarbons (HC). New York State has also established ambient air quality standards for the above contaminants, in addition to standards for settleable particulates, beryllium (Be), fluorides, and hydrogen sulfide (H_2S).

Both the Federal and New York State ambient air quality standards refer to total ground level concentrations. The total ground level concentration at a given receptor in the Somerset area at the time the proposed facility commences operation will be the sum of the proposed facility contribution and their ambient background. Thus, the total concentrations must be estimated for comparison to the appropriate ambient air quality standards. This comparison is accomplished in the following sections.

4.186
The Prevention of Significant Air Quality Deterioration (PSAQD) regulations establish allowable incremental increases of SO_2 and TSP above the existing ambient baseline. The PSAQD standards apply only to the contribution of the proposed facility to ground level concentrations, and have been addressed in Chapter One, "Air Quality Discharges and Control Methods." Comparison of estimated emissions to Federal New Source Performance Standards is also presented in Chapter One. All standards are expected to be met.

4.187
Also discussed in the following sections are the ultimate fate of the various stack effluents and the impact on the environment surrounding the Somerset site. Finally, the impact on air quality of infrequent auxiliary boiler operation is examined.

Methods for Estimating Total Ground Level Concentrations

4.188
A description of the diffusion models used to estimate the ground level concentrations resulting from the operation of the proposed facility is provided in Appendix B. The inversion breakup fumigation and lake breeze fumigation models have been utilized to estimate elevated short term concentrations under postulated "worst case" meteorological conditions. The hour-by-hour Gaussian dispersion model was utilized to calculate total ground level concentrations of SO_2, NO_2, and TSP for each hour of the data base period 1 August 1974 through 31 July 1975. Total ground level concentrations of these contaminants were predicted with concurrent hourly meteorological and air quality data collected at the Somerset site during the data base period. The total concentration for a given hour consisted of the proposed facility contribution and the ambient background for that hour. It was assumed that the ambient air quality data collected during the data base period will be representative of background air quality levels when the proposed facility commences operation. Using the hour-by-hour model, total ground level concentrations of SO_2, NO_2, and TSP were calculated for each averaging period for which there is a Federal or New York State ambient air quality standard. Total ground level concentrations of

other contaminants for which there are ambient air quality standards, such as CO, were not calculated with the hour-by-hour model since hourly background values for these other contaminants were not available. However, estimates of the proposed facility contribution to ground level concentrations of CO, HC, Be, and fluorides are given along with, wherever possible, an indication of likely background levels of these contaminants.

Total Ground Level Concentrations of SO_2, NO_2, and TSP

4.189
Calculations of total ground level concentrations of SO_2, NO_2, and TSP were made with the hour-by-hour dispersion model described earlier, using hourly meteorological and air quality data collected from 1 August 1974 to 31 July 1975. Calculations were performed for three postulated proposed facility operating conditions (100 percent, 75 percent, 50 percent). Table 4-17 shows the maximum calculated total concentrations for each of the contaminants with the appropriate National Ambient Air Quality Standards (NAAQS) or New York State Ambient Air Qualtity Standards (NYSAAQS) and the proposed facility load condition. In all cases, the estimated concentrations are lower than those specified in the standards.

4.190
The maximum three-hour SO_2 concentration in the data base year calculated with the hour-by-hour model presented in Table 4-17 consists of a proposed facility contribution of 240 ug/m^3 and an ambient background of 13 ug/m^3. A potential maximum facility three-hour total concentration of 542 ug/m^3 is postulated for a combination of the worst-case three-hour lake breeze fumigation condition (412 ug/m^3 and the maximum one-hour background SO_2 concentration of 130 ug/m^3 with northerly winds. The potential maximum value of 542 ug/m^3 SO_2 is also well within the State and Federal three-hour SO_2 standard of 1,300 ug/m^3. Due to the shifting and transitory nature of lake breeze fumigation, it is unlikely that air quality will be significantly affected at any location. Based on research collected in the spring and summer of 1974, lake breeze fumigation could be expected on five to 10 days per year, mostly in May and June.

TABLE 4-17

SOMERSET SITE
MAXIMUM CALCULATED TOTAL GROUND LEVEL CONCENTRATIONS
OF SO_2, NO_2, TSP
WITH THE HOUR-BY-HOUR GAUSSIAN DISPERSION MODEL
PROPOSED EMISSION CONTROL SYSTEMS

Contaminant	Averaging Period	Standard[a] (ug/m^3)	Maximum Calculated Concentration (ug/m^3)	Percent of Standard	Station Load
SO_2	3 hr	1300	253	19	75%
SO_2	24 hr	365	99	27	100%
SO_2	annual	80	29.6	37	100%
NO_2[b]	annual	100	21.9	22	100%
TSP	24 hr	150	141.3	94	100%
TSP	annual	60	32	53	100%

Notes:

(a) Federal Primary or Secondary Ambient Air Quality Standard as given in 40 CFR 50.1. The 3-hour and 24-hour standards may be exceeded once/year. The SO_2 and NO_2 annual standards are for arithmetic mean, while the TSP annual standard is for geometric mean.

(b) All nitrogen oxides emitted from the stack are conservatively considered as NO_2.

4.191
For a 24-hour averaging period, the maximum predicted total SO_2 concentration was 99 ug/m^3 or 27 percent of the standard. It is of interest to note that the ambient background SO_2 during this 24-hour period was 95 ug/m^3, at a location 35 km NNE of the plant. In this case, estimated plant contributions to SO_2 concentrations at this particular spot were four ug/m_3. Of all locations considered, the maximum calculated plant contributions to 24-hour SO_2 levels is 60 ug/m^3 at a point 1.5 km SSW of the site. Table 1-25 presents calculated plant contribution to ground-level concentrations of SO_2.

4.192
The maximum annual average SO_2 concentration is expected to occur in the southeast sector at a distance of 22 kilometers from the site. The calculated value of 29.6 ug/m^3 which is 36 percent of the 80 ug/m^3 standard largely reflects the mean background SO_2 level of about 0.01 ppm (26 ug/m^3).

4.193
Inversion breakup and lake breeze are meteorological conditions that can cause SO_2 emissions to have a noticeable impact on the environment. Under these conditions, as discussed in Chapter Two, emissions are fumigated to ground level downwind of the site. The area affected will depend on meteorological conditions and may shift from hour to hour as the wind shifts, causing a "spotting" effect.

These fumigation effects would generally be less than three hours in duration since it is seldom that all conditions for maximum fumigation will occur simultaneously for longer periods of time.

4.194
The only standard for oxides of nitrogen is the 100 ug/m^3 annual average standard (both a NAAQS and NYSAAQS) for NO_2. Although the stack effluent initially contains mostly nitric oxide (NO) , the entire emission was assumed to be NO_2. The NO is oxidized to NO_2 after leaving the stack. The calculated maximum annual average of NO_2 is 21.8 ug/m^3 and occurs in the southeast sector at a distance of 22 kilometers from the stack. The proposed facility contribution to this value is less than 1.0 ug/m^3. Thus, the average of 21.8 ug/m^3 is mainly comprised of the ambient background NO_2 which is around 0.01 ppm (20 ug/m^3).

4.195
The proposed facility will have a high efficiency electrostatic precipitator which removes over 99 percent of the particulate matter from the flue gas. The particulate emission rates are therefore quite small and total ground level concentrations of total suspended

particulate matter (TSP) consist mainly of ambient background TSP. The maximum calculated 24-hour average TSP concentration during the data base year was 141.3 ug/m^3, of which background accounted for 141 ug/m^3. This maximum value is 94 percent of the NAAQS (secondary) value of 150 ug/m^3. The secondary NAAQS of 150 ug/m^3 may actually be exceeded once per year.

4.196
The NAAQS (primary) for the annual geometric mean TSP is 75 ug/m^3 and the secondary standard is 60 ug/m^3. The New York State Level I TSP geometric mean AAQS is 45 ug/m^3. The calculated geometric mean for the sum of the proposed facility contribution and ambient background is 32 ug/m^3 or 71 percent of the New York State Level I Standard, which is the most stringent annual TSP standard. Again, the calculated value largely reflects the mean annual background TSP levels in the Somerset area.

Estimates of Ground Level Concentrations of Carbon Monoxide and Hydrocarbons

4.197
Studies show that the proposed facility stack effluent will contain small amounts of carbon monoxide (CO) and hydrocarbons (HC). The emission rate of these two contaminants depends upon the boiler operating conditions. Although the exact emission rates cannot be specified for the proposed facility, typical emission rates of CO and HC have been tabulated by the EPA for large coal-fired boilers. The EPA emission factor estimate for CO is one pound of CO for each ton of pulverized coal burned. The emission factor for HC is 0.3 pounds of HC for each ton of pulverized bituminous coal burned. These emission factors are the same ones used to calculate the estimated facility emissions in Chapter One. Using the above emission factor for CO, the CO mass flux from the proposed facility stack is about 42 grams per second when the operating load is 100 percent. Ground level concentrations of CO resulting from the stack effluents have been estimated using the SO_2 ground level concentrations computed with the hour-by-hour diffusion model described earlier and allowing for the difference between the SO_2 and CO emission rates. The maximum calculated one-hour ground level CO concentration due to the proposed facility stack effluent is less than 25 ug/m^3. The NAAQS for one-hour average CO is 40,000 ug/m^3 and the eight-hour standard is 10,000 ug/m^3; both of these values may be exceeded once per year. Thus, the proposed facility will not contribute significantly to ground level CO concentrations even in "worst-case" (maximum effect) situations. Background CO levels in the Somerset area are expected to be far below the NAAQS levels.

4.198
Ground level hydrocarbon concentrations were computed in a similar manner. The maximum estimated three-hour average ground level HC concentration due to the proposed facility is about four ug/m^3. The NAAQS for nonmethane hydrocarbons is 160 ug/m^3 for a three-hour averaging period (6 a.m. to 9 a.m.). Thus, the proposed facility contribution to ambient hydrocarbon levels is small. Background levels of nonmethane hydrocarbons in the Somerset area were not determined since air quality monitoring data for nonmethane hydrocarbon concentrations were not available.

Given the applicant's estimated consumption of 8,200 tons of coal per day and the EPA emission factor of 0.3 lbs HC/ton, it is calculated that the plant will emit almost 450 tons of hydrocarbons per year. This would classify the plant as a "major source" of hydrocarbon emissions (defined as a source emitting more than 100 tons of non-methane hydrocarbons per year) and require emission offsets. Emission offsets of non-methane hydrocarbons are of issue since the Somerset Site vicinity is assumed non-attainment for ambient concentrations of photochemical oxidants, and non-methane hydrocarbons are considered atmospheric precursors of photochemical oxidants.

The EPA estimated emission factor of 0.3 lbs HC/ton is currently under question and may be revised to 0.01 lbs. HC/ton. Using this new factor, the calculated HC emissions from the plant would be approximately 15 tons per year instead of 450. If the EPA accepts and utilizes the new emission factor, the annual calculated HC emissions (15 tons/yr) will be well below the 100 tons/yr standard and no emission offsets would be required.

4.199
Air quality levels of non-methane hydrocarbons are of primary concern for their role in the formation of photochemical oxidants (O_3) in the atmosphere. The NAAQS for photochemical oxidants is 160 ug/m^3, a one-hour average that can be exceeded only once per year. The chemical reactions associated with the formation and buildup of photochemical oxidants (O_3) in the atmosphere are complex and not completely understood at the present time. The principal species involved in the reactions are nitric oxide (NO), nitrogen dioxide (NO_2), and various reactive non-methane hydrocarbons. Non-methane hydrocarbons apparently allow O_3 (which otherwise would react with the NO) to build up. One other gaseous contaminant for which an air quality standard exists is H_2S. The NYSAAQS for H_2S is 14 ug/m^3, a one-hour average which is never to be exceeded. The stack effluent is not expected to contain H_2S due to the oxidizing nature of the combustion process.

Trace Element Emissions

4.200
Trace elements are usually defined as those present in the earth's crust to the extent of 0.1 percent (1,000 ppm) or less. The type and amount of trace elements contained in coal depends upon many factors such as the type of coal, its geographic source region, geologic characteristics of the particular seam from which the coal was taken, etc. On combustion, the trace elements in the coal are transferred to slag, fly ash, and gases. The trace metals discharged to the atmosphere via the stack effluent will be those in gaseous form and those associated with the fly ash not removed from the flue gas. An estimation of stack emission rate for a particular trace element requires a number of assumptions, and each assumption involves a degree of uncertainty. Thus, the uncertainty in the end result (the emission rate) can be quite large. A knowledge of the emission rate permits calculation of a ground level concentration of the particular trace element through use of the Gaussian dispersion models described earlier.

4.201
At the present time there are no NAAQS's for trace elements discharged from steam electric generating stations. However, several trace elements have been identified as hazardous to human health, including beryllium, cadmium, arsenic, fluorine, mercury, lead, and selenium, all of which are found in coal. New York State has promulgated ambient air quality standards for beryllium and fluorides. In view of the uncertainties in determining stack emission rates of trace elements, the lack of ambient air quality standards for all except two trace elements, and, the absence of ambient monitoring data for most trace elements, ground level concentration estimates are not given here for each trace element that may be contained in coals utilized by the proposed facility. The difficulties in performing such estimates are illustrated below for the trace elements of beryllium and fluorine, for which New York State has established ambient air quality standards.

4.202
The NYSAAQS for beryllium is that the monthly average concentrations shall not exceed 0.01 ug/m^3. A crude calculation indicates that the monthly average beryllium concentration from the proposed facility would be on the order of 0.00015 ug/m^3. Ambient background beryllium levels in the Somerset area are expected to be less than 0.0002 ug/m^3.

4.203
New York State has promulgated the following ambient air quality standards for gaseous fluorides in air (as fluorine): 12-hour

averages to be less than 3.7 ug/m^3, 24-hour averages to be less than 2.85 ug/m^3, one-week averages to be less than 1.65 ug/m^3, and one-month averages to be less than 0.8 ug/m^3. The maximum 24-hour average fluoride concentration (assuming the fluoride remains in gaseous form) from the proposed facility is estimated to be about 0.8 ug/m^3, which is less than the daily and weekly NYSAAQS's. The maximum monthly ambient fluoride concentration from the proposed facility is expected to be about 0.06 ug/m^3. Calculations of the 12-hour average fluoride concentration were not made, but it is not expected to exceed 1.6 ug/m^3. No measurements of ambient fluoride concentrations are available for the Somerset area, but rural measurements of total atmospheric fluorides in the United States are almost always less than 0.05 ug/m^3.

4.204
Concerning the potential impact of radioactive emissions from the proposed facility, Martin et al (1971) have calculated the fraction of the ICRP (International Commission on Radiological Protection) recommended dose for bone and lung doses for the emission of nuclides in the uranium and thorium decay series from a coal-fired power plant. The hypothetical plant considered was a 1,000 MWe plant, which would emit 47.9 millicuries/year of mixed radium and thorium isotopes. The cumulative bone dosage from soluble radioisotopes was found to be the most critical dose. For an effective coal plant stack height (including physical stack height and plume rise) of 300 feet, the ratio of the calculated 50-year bone dose to the maximum recommended ICRP limit was 8.6 x 10^{-6}MWe, or 8.6 x 10^{-3} for a 1,000 MWe plant. This dosage ratio represents less than one percent of the maximum recommended ICRP limit. If the radioactive emissions estimates given in Chapter One are representative of the coal(s) selected for the proposed facility, then the maximum potential dosage from the proposed facility, even allowing for potential variations in the atmospheric dilution factors, should be no greater than the value calculated by Martin et al, due to the lower overall radioactive emissions due to the proposd facility's more efficient fly ash removal (at or below 0.05 pounds/10^6 Btu) and smaller size (850 MWe).

Contribution of the Proposed Facility to Local and Regional Acid Precipitation

4.205
Table B-4 shows the calculated emission rates for SO_2, H_2SO_4, and NO_x for the proposed facility. These rates are calculated on the basis of compliance with New Source Performance Standards. EPA estimates of manmade SO_2 emissions in the 24-State northeast United States region encompassing the Somerset site are about 22 x 10^6 tons per year (indicated to to be more or less steady over the next

decade). The contribution of the proposed facility to this total is 41,000 tons per year at 100 percent load and 365 days per year operation. This constitutes about 0.2 percent of the total and at projected station operating levels would be substantially smaller than this. Assuming that this factor also applies to the proposed facility NO_x contribution, then about a maximum of 0.2 percent of the 24-State regional acid precipitation deriving from anthropogenic sources might be attributable to operation of the proposed facility.

4.206
The significant contribution of the proposed facility to local acid precipitation will generally occur within about 50 miles of the plant site. Within this radius, precipitation can wash H_2SO_4, HNO_3, and SO_2 out of the plume in amounts detectably greater than that contributed by the normal background levels found for these substances in the upstate New York region. The contribution from NO in the plume will be relatively negligible due to its limited water solubility.

4.207
Estimates of the plant contribution can be made by sophisticated plume modelling techniques, but because of the many assumptions and uncertainties involved, the results are generally unsatisfactory. However, experimental observations have been made of plume washout contributions to acid precipitation at a 1,200 MW power plant in Centralia, Washington, with an estimated H_2SO_4 emission rate of 395 lbs/hr. This is somewhat lower than the Somerset plant's estimated H_2SO_4 emission rate of 511 lbs/hr but should serve as a valid example for predicting effects of acid rain resulting from Somerset H_2SO_4 emissions. The estimated H_2SO_4 emission rate of 511 lbs/hr is based on two percent of the SO_x emitted as SO_3 and 65 percent of the SO_3 in the FGD system.

4.208
During rainfall, the amount of H_2SO_4 scavenged up to seven miles downwind from the plant stack can be calculated to be about 45 percent of the amount emitted from the stack. This discounts the formation of additional H_2SO_4 after oxidation of SO_4 after exiting the stack, which may occur to some degree.

At an emission rate of 511 lbs/hr, this would result in scavenging of about 230 lbs of H_2SO_4 per hour.

Based on the Centralia data, it is predicted that at the proposed facility the lowest pH under the centerline of the plume during rainfall would be about 3.68, which includes a background contribution from the surrounding atmosphere equivalent to pH = 4.4. This value would be expected to attenuate to the background value at about 50

miles from the plant. Initially, the contributing acid would be almost exclusively sulfuric acid, but with increasing distance from the plant, increasing amounts of nitric acid would be present.

4.209
It should be noted that the rainfall pH of 3.68 would apply only for that downwind sector from the proposed facility in which the plume is located, and that the other downwind sectors would retain the background pH value of the rain of 4.4.

Little washout of NO is expected since its solubility in water is appreciably less than that of SO_2.

The Centralia data indicate that although SO_2 is the major component of the plume contaminants, it is not effectively washed out by rainfall. Thus, at seven miles from the stack only 0.5 percent of the original SO_2 is removed. There are several reasons for this. First, the SO_2 dissolves rapidly in rain drops in a reversible manner. Therefore, as the raindrop falls through the plume the dissolved SO_2 concentration quickly builds up, but equally as thick begins to decrease as the drop leaves the plume. The dissolved SO_2 measured in ground level rainwater is essentially in equilibrium with the ambient SO_2 concentration. Second, the SO_2 solubility goes down rapidly as the pH drops, so that the more acid the rain the smaller the amount of dissolved SO_2. The behavior of the proposed facility plume is expected to resemble that observed at Centralia.

4.210
Thus, precipitation is not very effective in washing SO_2 out of the atmosphere and the transport distance may range from a few hundred kilometers to over 1,000 kilometers. At a nominal wind velocity of five meters/second, the SO_2 residence time may vary from five hours to more than 50 hours. Factors affecting the SO_2 residence time are relative humidity, plume stability, particulate loading, degree of sunlight, and many others, all of which determine the rate of oxidation of SO_2 to sulfates and hence the rates of wet and dry deposition.

The above comments apply only to below cloud scavenging of SO_2. Scavenging in clouds could very easily lead to rapid oxidation of dissolved SO_2 to sulfuric acid and sulfates and hence its more rapid removal from the atmosphere. Knowledge of in-cloud phenomena is inadequate to allow quantitative analysis of its effect on the SO_2 residence time.

The term "deposition zone" does not have a precise technical meaning. The length and breadth of the "deposition zone" will vary greatly depending on meteorological conditions but may be thought of as

extending from the stack out to distances exceeding 1,000 kilometers and having breadths of a few kilometers near the stack and of 100-200 kilometers at a distance of 1,000 kilometers from the stack. During dry periods, SO_2 is removed from the atmosphere by dry deposition and oxidation to sulfates. Both of these processes may be quite slow, especially if the relative humidity is low and the SO_2 is emitted from a tall stack. In these circumstances, the SO_2 residence time may well exceed 50 hours and the transport distance, 1,000 kilometers.

4.211
Dry deposition of SO_2 emitted from a tall stack, such as that proposed for the Somerset station, has been shown to be relatively unimportant up to a distance of 50 kilometers from the point of origin. Also, within that distance, the rate of conversion to particulate sulfate (includes H_2SO_4 and ammonium sulfates) is relatively slow. Beyond 50 kilometers, dry deposition of SO_2 becomes the important removal mechanism and may account for some 60-70 percent of the SO_2 disappearance. The rate of SO_2 oxidation also picks up beyond the 50 kilometer mark and may reach five percent per hour. It has been estimated that some 30-40 percent of the emitted SO_2 may eventually get converted to particulate sulfate. All of these values depend on a variety of meteorological factors and must be regarded as approximate only.

4.212
Wet deposition of particulate sulfates is the most significant removal mechanism, possibly accounting for 90 percent of their disappearance from the atmosphere. A variable but important fraction of these particulate sulfates will exist as ammonium acid sulfate and free sulfuric acid and therefore contribute to the phenomenon of acid precipitation.

4.213
The extent and significance of regional effects of acid rain on ecosystems has not yet been completely investigated. Lakes in the Adirondak Mountains have been found to be acid-sensitive due to their low buffering capacity. Fish populations have declined in 11,546 acres of Adirondack Lakes.

Evaluating the impacts of increased sulfate loading on the lakes in any quantitative way is not possible at this time. Although it can be assumed that with increasing acidity of rain increasing numbers of lakes would lose their fish, whether the addition of one more coal-fired generating plant which meets present emission standards would cause a detectable difference in any lake cannot be predicted.

4.214
Other regional resources which might be acid sensitive include forests with acid soils. A decrease in productivity in some forests due to acid precipitation has been postulated, but not conclusively demonstrated.

On a regional basis, the increasing use of tall stacks may permit a higher proportion of SO_2 to be converted to particulate sulfates rather than be removed by dry deposition processes. Long-term effects cannot be predicted at this time.

4.215
Of current concern are the effects of what are commonly called sulfates for which SO_2 is a precursor. Several studies have indicated that SO_2 may not be the most harmful of the various forms of sulfur oxides. In a March 1975 NAS/NAE report to the Senate Public Works Committee entitled "Air Quality and Stationary Source Emission Control" it was concluded that "there are considerable uncertainties concerning the extent of the harmful effects of sulfur oxide emissions, the molecule species responsible for the effects and the specific relationships between point source emissions of sulfur dioxide and regional patterns of formation, dispersion and deposition of sulfates." Sulfate formation is a time reaction and thus may have greater significance in areas 30 miles or more downwind from the emission source.

The question of sulfate damage is a matter of current investigation. For example, California is considering imposing a 24-hour maximum sulfate standard not to exceed 25 ug/m^3. Measured levels of atmospheric sulfate in New York State are generally 25 ug/m^3 except for infrequent higher values in certain urban areas. Sulfate levels in the vicinity of the Somerset site have not been measured. The extent and significance of sulfate damage is still undetermined. The New York State DEC recommends strict adherence to NSPS and PSAQD restrictions, whichever results in the lowest emissions.

Ecologicl Effects of Emissions

4.216
Air pollutants from fossil-fueled generating stations can potentially interact with the ecosystem both directly and indirectly. Direct effects are primarily local and come from the action of SO_2, NO_2, and particulates on terrestrial vegetation shortly after discharge from the generating station. Indirect effects come from acid precipitation after SO_2 and NO_2 have reacted in the atmosphere to form sulfuric and nitric acids. Acid precipitation can be both local and regional in extent and act on both aquatic and terrestrial ecosystems.

4.217
At the present levels of pollutants, any assessment of damage produced on crops, structures, health or visibility is largely speculative. In general, at ambient concentration levels below that established by Federal EPA and the New York State DEC, damage should be low or undetectable. It cannot be denied, however, that some impacts from air contaminants will occur. Below the levels established by the ambient standards these effects are virtually impossible to quantify. These standards, established as a result of observed effects and epidemiological studies, have recently been reviewed by the National Academy of Sciences, National Academy of Engineering (NAS/NAE). According to their report, the primary health-related standards are now set at levels below those at which effects have actually been observed. The difference constitutes the safety margin. There is not and cannot be any guarantee that such effects are completely absent even at the level of the ambient air quality standards. This report also found that "the evidence that has accumulated since the promulgation of the Federal ambient air quality standards...supports those standards."

4.218
The pollution level at which visible injury to plant life may occur has been well documented for short-term exposures. Species injured by a one-hour average SO_2 concentration of 0.5 ppm would be considered sensitive. Genetically sensitive individuals of the most sensitive conifer species may be injured by exposures that exceed 0.25 ppm maximum 30 minute average for several hours, while other species apparently withstand considerably higher levels before showing visible injury (e.g., 2.0 ppm for two hours).

4.219
The maximum one-hour ground level SO_2 concentration from the proposed facility and ambient background is predicted to be 715 ug/m^3 (0.27 ppm). No permanent injury to plant or animal life at or near the Somerset site is expected at these levels. Additionally, no adverse effects to human health are expected at these SO_2 levels.

It should be noted, however, that chronic long-term exposure to low levels of SO_2 may have adverse effects on plant and animal life that would not appear in short-term studies. Therefore, it is not safe to assume that presently undetected effects will not occur in the future. The possibility of synergistic effects should also not be overlooked.

4.220
Sulfur dioxide and sulfuric acid accounted for some $75 million per year (1972 figures) in material damages in the United States, due mostly to corrosion of painted and unpainted surfaces normally

exposed to the environment. For other materials, the threshold damage levels are greater than that for corrosion to exposed surfaces. Corrosion is greatly affected by the relative humidity. In more polluted humid areas, additional costs are borne by the public because of deterioration which may shorten the normal service life of metal products such as galvanized gutters, down-spouts, barbed wire, chain-linked fence, fence posts, transmission towers, and wire cables.

4.221
The effects of increased acidification of precipitation on terrestrial and aquatic ecosystems are still being evaluated. In Scandinavia and in the Adirondack Mountains, a sharp decline of the fish in some lakes and streams has been linked to acid rain. The acidity of a lake or stream receiving acid rain either directly or from land runoff will depend not only on the acid content of the precipitation, but on the buffering capacity of the water body itself. Lakes with high calcium carbonate content such as Lake Ontario are less apt to have their pH significantly reduced than lakes whose watersheds are underlain by highly resistant bedrock with low calcium and magnesium content. The carbonate ions from calcium and magnesium carbonates serve as buffers, taking up H^+ ions and forming bicarbonates. No impact of similar magnitude on the terrestrial ecosystem has been identified, although some scientists have attributed declines in forest productivity and changes in soil chemistry to acid rain.

4.222
Any potential impact on the terrestrial and aquatic ecosystems from increased acidity of precipitation due to the operation of the proposed facility at the Somerset site will probably be regional and diffuse rather than local. Should an increase in the acidity of rain in the area of Lake Ontario occur, either from operation of the proposed facility or from all other sources, Lake Ontario is not apt to be significantly affected because of its large volume and its buffering system. Studies by the applicant in Lake Ontario in 1974 found that alkalinity ranged from 76 to 101 mg/l as $CaCO_3$ and pH ranged from 6.9 to 8.5. These data indicate a relatively strong buffer system in Lake Ontario.

4.223
In the case of NO_2, injury to sensitive plants can occur at exposures of about two to 10 ppm for one hour.

Chronic effects on vegetation (e.g., suppression of growth) have been known to occur at NO_2 levels around 0.5 ppm (1,000 ug/m^3).

Synergistic effects of SO_2 and NO_2 occur at 0.05 to 0.25 ppm NO_2. Because the annual average ground level NO_2 concentration near the Somerset site is about 0.01 ppm and the one-hour maximum level will not exceed 0.23 ppm, vegetation damage is not expected to occur from NO_2. In addition, no adverse effects to animal life or human health are expected at these low NO_2 levels.

4.224
According to the New York State DEC, the 100 ug/m^3 (0.05 ppm) annual NO_2 standard will afford reasonable protection for vegetation against the direct effects of NO_2. This conclusion is based on the assumption that within the year extremely high values do not exist for short time periods. Such high-value concentrations are 1,000 ug/m^3, 500 ug/m^3, 250 ug/m^3, and 120 ug/m^3 for one-hour, eight-hour, 24-hour, and monthly averaging periods, respectively.

4.225
Particulate matter has been linked to vegetation injury, but only under rather extreme conditions and when accompanied by free moisture. The predicted particulate emissions are considerably below those reported to cause vegetation injury. Moreover, no adverse effects to human health or animal life are expected at the predicted particulate concentrations, as long as the average values do not arise from relatively short periods of high concentration. The ambient concentrations of the various emissions will not have a significant impact on soils.

Visibility

4.226
Impacts on visibility due to operation of the proposed facility can potentially be caused by a stack vapor plume, and/or particulate emissions from the stack. It is not anticipated that particulate matter stack emissions will cause any significant impact on atmospheric visibility. The particulate emissions from the proposed emission control systems will meet an equivalent stack exit opacity of 15 percent and at this low opacity humanly noticeable light obscuration should be near minimal. Beyond the stack exit, particulate matter concentrations will be significantly reduced by atmospheric dilution. A stack vapor plume, partially due to the added moisture from the FGD system, will be visible during cool and/or humid periods. The visibility impacts of the intermittent vapor plume are unavoidable and will affect to various degrees nearby areas of residential and recreational land use. There are no unique or significant scenic views that will be affected by the proposed facility.

Auxiliary Steam Boiler Air Quality Impact

4.227
Because the auxiliary boiler operates infrequently for short periods, the ambient air quality standard of concern is the New York State one-hour SO_2 standard of 1,300 ug/m^3. The auxiliary boiler effluent will reach ground level in elevated concentrations during unstable atmospheric conditions with light to moderate winds. Calculations with a Gaussian model similar to the hour-by-hour model described earlier show the maximum one-hour SO_2 concentration expected for these conditions with both boilers operating at full load is about 13 ug/m^3. The maximum concentrations occur within several hundred meters of the stacks.

4.228
Elevated short-term concentrations are also possible due to effluent downwash in the boiler house wake. Calculations made with a volume source formula and a building shape factor of two indicate that the maximum one-hour SO_2 concentration for these conditions with both boilers operating at full load is about 80 ug/m^3. For one boiler operating at 25,000 pounds of steam per hour, the maximum expected downwash concentration is 40 ug/m^3.

Plant Structures

4.229
Physical obstruction of wildlife movement due to plant structures will cause additional impacts to the terrestrial environment. The height of the exhaust stack (450 feet) may pose an obstruction to migrating birds, especially during times of limited visibility. This could result in additional bird mortality at the proposed site. Possible mitigative measures include the use of strobe lighting to act as a visual repellant. Fencing required for security and safety reasons will disrupt the established movement corridors used by deer and other mammals. The fencing, if it is erected in close proximity to highways, may also result in increased road kill of mammals.

PROBABLE IMPACT OF THE PROPOSED ACTION ON COAL MINING REGIONS

4.230
Operation of the Cayuga Generating Station at Somerset will require the direct consumption of 90,000,000 to 105,000,000 tons of coal as fuel for the station. Additional energy resources will be indirectly consumed in support operations such as mining and materials shipping. The applicant proposes to contract with a supplier of high-sulfur coal. The area affected in obtaining 90 million tons of coal would depend principally on the thickness of the seam. As coal seams vary in thickness, 90 million tons could underlie between 1.5 and six

square miles. It should be recognized, however, that at any one time the extent of surface so disturbed would be substantially less than the area covering 90 million tons of coal.

4.231
The impact of strip mining and deep mining on groundwater quality is of prime concern. The coal seam is the main aquifer in many areas, although it is usually of poor quality. By removing coal, part or all of the aquifer could be destroyed. Researchers are uncertain as to the extent of destruction. Some evidence points to the conclusion that strip mining a poor aquifer will have little impact more than a mile away from the mine site, while strip mining a good aquifer will cause lowering of the groundwater beyond the one-mile radius. The major concern with groundwater quality is that toxic materials in the overburden (the soil above the coal seam) be kept from contaminating existing or potential groundwater aquifers. These toxic materials include ammonium, lead, mercury, nitrates, and salts. Surface water may be impacted indirectly by contaminated groundwater or directly by pitwater pumped from the mines. It is believed that direct impacts can be avoided by drainage water management and proper treatment of pitwater. Strip mining disrupts the normally well-developed, layered soil. Soil structure and its contribution to plant productivity is destroyed. Plant reestablishment is hindered, which encourages erosion by wind and water. Studies on old mine spoils show that the beginnings of soil redevelopment can be seen only after 30 to 50 years. The reclaimed topography will be flat. Rainfall in the area should be adequate to permit revegetation. Introduced grasses, which have higher productivity for pasture and haylands than native species, could be planted. Introduced species are easier to develop on reclaimed land because their characteristics are well known. For recreation and wildlife, native species, which are slower in reestablishing, are more productive.

The requirements and restrictions of the Surface Mine Reclamation Act of 1977 may affect the cost of mining activities and therefore influence the price of coal from each mining region, which may be a factor in coal selection.

HISTORICAL AND CULTURAL RESOURCES

4.232
Although there are no sites in the area of the Somerset site which are listed in or nominated for, The National Register of Historic Places, three areas might meet the criteria for nomination. These sites are the Badgley House, the Van Wagoner House, and the Pettit Farm. (Although much damage has occurred to the Pettit Farm as a complex, individual buildings may be of National Register quality.)

4.233
For each property determined eligible (see Appendix E), the District Engineer will consult with the State Historic Preservation Official to review the effect that the applicant's proposal will have on the resource. Upon ascertaining the effects, the District Engineer will proceed with the prescribed consultation procedures pursuant to 36 CFS 800.5 (Advisory Council on Historic Preservation-Procedures for the Protection of Historic and Cultural Properties). Corps compliance with these regulations and procedures will insure that necessary safeguards are implemented to protect the properties from significant adverse effects.

4.234
The Badgley House was located in the proposed ash disposal area but was recently destroyed by fire.

4.235
The Van Wagoner House is located on the construction and truck access road. The house would be either demolished or relocated before construction begins. If the house is razed, any items of historical significance would be salvaged.

4.236
The Frost Homestead and Pettit Farm are both in the area of the proposed railroad right-of-way. Although the Frost Homestead has already been razed, the railroad spur construction could do further damage to the remaining foundations.

4.237
Although some of the buildings on the Pettit Farm have been demolished, railroad construction could further alter the foundations of the previously destroyed buildings. In addition, the remaining buildings might be razed.

4.238
There are no other sites, structures, or objects on the Somerset site which will be impacted by the proposed facility. There are no natural landmarks on the site. No impacts on archeological resources of the site are expected as a result of station operation with the exception of fencing which would restrict access to onsite resources.

AESTHETICS

Visual

4.239
The station at the Somerset site will alter the visual aspects and rural character of the land. In particular, the 450-foot high stack

will have a definite visual and aesthetic impact. The turbine generator/silo/boiler will be housed in a complex with a maximum height of approximately 300 feet. Most of the elements are not particularly offensive and should conform satisfactorily with the environment. The most unpleasant elements due to their color, mass, and generation of dust will be the 45-foot-high coal piles, 70- to 80-foot high stabilized sludge and bottom ash mounds, and limestone storage piles.

Visual impacts will be ameliorated to an extent by an existing vegetative screen depending on the point of observation. The stack will be seen almost in its entirety from some observation points, whereas from others the stack will be completely obscured. Existing and planned foliage barriers will help to reduce the visual starkness of the station, especially during the months of foliage.

4.240
The visual impact during operation will be a consequence of the scale of the facility, particularly the mass of the stack, in contrast to the surrounding topography and flora. The areas most affected during months of foliage will be the residential areas and recreational facilities close to the Somerset site. Krull Park and Golden Hill State Park will be affected. The station will not be recognizable from the northern extremity of Krull Park, although the upper portions of the stack will be visible from most other locations. The stack will also be visible from Golden Hill State Park. The visible impact of the station, especially that of the stack, will be increased during the defoliate months.

4.241
The greatest potential visual impact will be on those who view the station from Lake Ontario, since most of the facility, including the stack, will be visible from the lake. Although boating, water skiing, and fishing are popular recreational uses associated with the lake, the potential visual impacts of the station on sensitive water uses will be neutralized by the magnitude of the lake. A buffer zone of trees which will be planted along the water's edge will also help minimize the visual impact on Lake Ontario although the station will still be visible for some distance and it could take considerable time for vegetation to reach effective heights. Climatic conditions will vary the intensity of impact from all quadrants. The stack could serve as a navigational landmark.

4.242
Landscape treatment will be made at the Service-Administration Building. This will include walks, planting screens, shade trees, and plant beds, previously discussed in this chapter for the aesthetic impact during construction.

4.243
Impacts on visibility due to operation of the proposed facility can potentially be caused by a stack vapor plume, and/or particulate emissions from the stack. It is not anticipated that particulate matter stack emissions will cause any significant impact on atmospheric visibility. The particulate emissions from the proposed emission control systems will meet an equivalent stack exit opacity of 15 percent and at this low opacity humanly noticeable light obscuration should be near minimal. Beyond the stack exit, particulate matter concentrations will be significantly reduced by atmospheric dilution. A stack vapor plume, partially due to the added moisture from the FGD system, will be visible during cool and/or humid periods. The visibility impacts of the intermittent vapor plume are unavoidable and will affect to various degrees nearby areas of residential and recreational land use. There are no unique or significant scenic views that will be affected by the proposed facility.

4.244
The proposed transmission lines will be constructed entirely on existing right-of-way where proper siting, hedgerows, and low exposure potential will minimize visual impact. In addition to these mitigating factors, buffer zones will be designated at all road and stream crossings if appropriate. These zones, in addition to protecting ecological values at streams, are designed to reduce visual impact at both roads and streams by maintaining a maximum of existing plant material and through the planting of new material where appropriate.

4.245
Fugitive dust will be controlled to a degree by various methods. The entire coal handling system from the rotary car dumper to the coal bunkers will be equipped with a coal dust suppression system. Sprays of water containing a surface active agent will be applied at all dumping, transfer and other points of disruption to minimize dust generation. The coal will be reclaimed from the coal pile with surface material handling vehicles such as bulldozers. Fugitive dust potential associated with the coal storage pile will be controlled by layering and compacting the coal. The design of the limestone handling and storage system is similar to that for coal. The system will be enclosed except for several open points such as the bottom-dump car unloaders and shakers (which will be located in a covered but open-ended structure), the stocking out conveyor on the limestone pile, and the open pile itself. No significant potential for fugitive dust should result and no dust suppression measures are planned for the open disruption points. If fugitive dust becomes a problem at these points, dust suppression controls, such as water sprays, will be incorporated.

Dust from stabilized sludge, fly ash, and bottom ash transportation and disposal will be handled as described in Chapter One under "Ash and FGD Sludge Disposal." Included are measures such as fly ash dustless unloaders, covered vehicles, and compaction and covering at the disposal site.

Lime for wastewater treatment will be either the hydrated (dry powder) or quicklime (pebble) type. Appropriate facilities such as bag dust collectors and closed systems will be provided to control dust.

Noise

4.246
In designing the station, primary consideration was given to minimizing the noise impact in the surrounding community. Impact, as defined in 16 NYCRR Part 75 of the New York State Regulations, is an increase of five dBA in the ambient sound level caused by plant operation and/or maintenance. Consideration was also given to several other criteria for evaluating noise impact, such as issued by the New York State Department of Environmental Conservation (EC) and the Federal Department of Housing and Urban Development (HUD).

4.247
The policy followed in analyzing and silencing the operational noise sources of the station was to assume the maximum noise levels that will result from any load at which the station may be operating. For purposes of evaluation, the site was divided into four quadrants (Figure 4-2) which represent the critical distances (distances to nearest residences or property lines). Critical distances for quadrants three and four are not defined since the noise radiating into these quadrants projects over Lake Ontario. The unsilenced noise levels for each of the identified major noise sources for station operation at the critical distance in each quadrant are listed in Tables 4-18 and 4-19.

FIGURE 4-2

SOMERSET SITE
ORIENTATION OF QUADRANTS WITH
RESPECT TO STATION

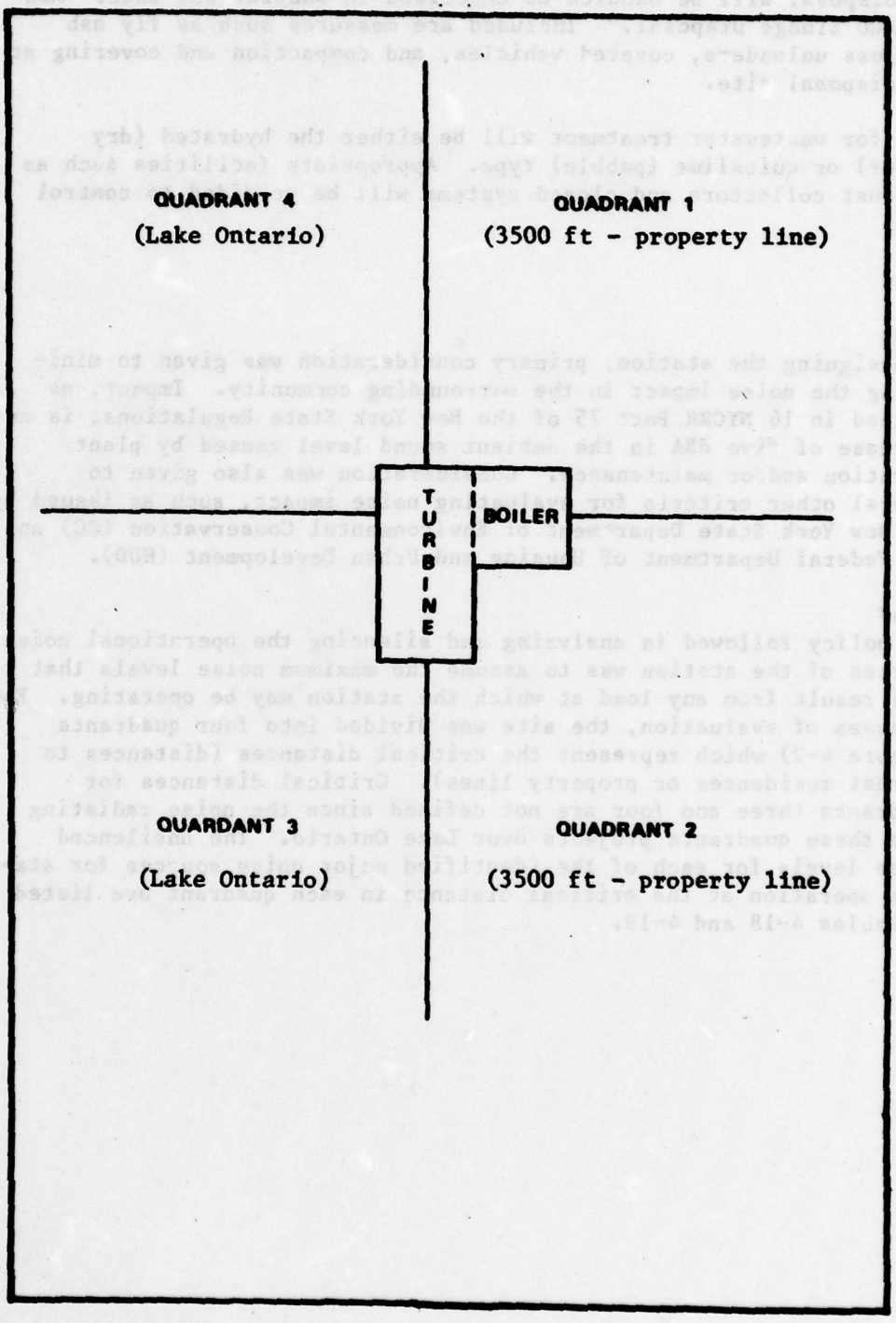


TABLE 4-18

SOMERSET SITE QUADRANT 1 - UNSILENCED NOISE AT 3,500 FEET

Noise Sound/ Bands (Ks)	63	125	250	300	1K	2K	4K	8K	dBA*
Louvers	54	49	45	44	32	22	8	-	43
Gas Ducts	69	59	46	33	23	3	-	-	47
Stack	64	53	52	45	38	30	17	-	47
ID Fan Casing	54	46	33	20	10	-	-	-	33
FD Fan Inlet	61	60	56	51	47	37	24	-	53
Vent Fans	37	37	32	25	17	6	-	-	29
ID Fan Motors	34	38	38	36	34	26	7	-	38
PA Fan Intakes	63	62	58	53	49	39	26	-	55
Walls	55	47	40	26	12	-	-	-	35
Total									58

* Weighted summation.

TABLE 4-19

SOMERSET SITE QUADRANT 2 - UNSILENCED NOISE AT 3,500 FEET

Noise Sound/ Bands (Ks)	63	125	250	300	1K	2K	4K	8K	dBA*
Louvers	54	49	45	44	32	22	8	-	43
Gas Ducts	69	59	46	33	23	3	-	-	47
Stack	64	53	52	45	38	30	17	-	47
ID Fan Casing	54	46	33	20	10	-	-	-	33
FD Fan Inlet	61	60	56	51	47	37	24	-	53
Vent Fans	37	37	32	25	17	6	-	-	29
ID Fan Motors	34	38	38	36	34	26	7	-	38
PA Fan Intakes	63	62	58	53	49	39	26	-	55
Walls	58	49	42	28	13	-	-	-	37
Transformer	-	-	-	-	-	-	-	-	47
Total									58

* Weighted summation.

4.248
The station design results in a noise level radiating from the plant to the community of less than 40 dBA at residential areas. This results in defined impacts in quadrants 1 and 2. In order to meet this criterion, economic and performance evaluations will be conducted during the design phase of the project. Consequently, the resolution of the degree to which each source would be silenced would depend on the best cost/performance effectiveness that could be achieved during the design evaluation. The following noise control measures would be applied:

-Forced Draft and Primary Air Fan Intakes - inlet silencers and acoustical enclosures for the fans.
-Gas Ducts - acoustical and thermal insulation.
-Transformers - purchase quiet transformers and build barriers.
-Walls and Ceilings - addition of acoustically absorptive materials.
-Stacks - induced draft fan exhaust silencer.

4.249
The defined impacts (five dBA or greater) during the summer will occur to a radius of about 4,000 feet during the weekday evening and nighttime and weekend evening periods, and to about 9,000 feet during the weekend nighttime period. Fewer than 10 residences will be impacted during the nighttime periods. The sound levels will be 40 dBA or less during the weekday nighttime period and 35 dBA or less during the weekend nighttime period at all those residences impacted. These levels are below the standards proposed by the DEC for nighttime noise (45 dBA at residential areas). There will be no defined impact during the summer daytime periods. Due to the low levels that will be experienced, little annoyance (if any) is expected.

4.250
The defined impacts during the winter will occur to a distance of about 6,000 feet during the evening and nighttime periods and to 4,000 feet during the weekday daytime period. Approximately 10 homes will be affected during the evening and nighttime, with the new L_{50} noise level being 40 dBA or less. There will be no defined impact at any residence during either daytime period. Again, little annoyance (if any) is expected. It is expected that vehicular noise levels would not be greater than those presently experienced in the area.

4.251
The only major source of maintenance noise is the annual checking and resetting of the safety valves, which results in an impulsive noise. Silencing of these valves is not feasible because of boiler code safety regulations. Since this procedure occurs for a short period, only once a year and during normal working hours, notification of the public beforehand should reduce the annoyance.

4.252
A post-operational noise survey will be conducted soon after commercial operation. If corrective noise action is required, it will be expeditiously applied. It should be noted that the station is being designed so that no corrective noise action should be necessary.

SOCIAL AND ECONOMIC IMPACTS

Energy Resources

4.253
The goal of the current Government energy programs is to substantially reduce dependence on imported petroleum. The use of coal plays a prominent role in the overall policy, both because of legislative authority and the abundant reserves of coal. By increasing the use of coal, our nation's most available energy

resource, the scarcer fuels, such as oil and natural gas, are reserved for priority uses. Therefore, the selection of coal or nuclear power as the major fuel source for the proposed facility as well as many other new power plants, appears appropriate. Assuming the applicant utilizes a coal source having a heat output of approximately 11,600 Btu/lb, roughly 8,200 tons of coal per day will be consumed or nearly 3,000,000 tons per year. This estimate is based on the station operating at 100 percent capacity 365 days per year. While not contrary to law, the applicant's proposed use of oil-fired auxiliary boilers is not consistent with national energy policy.

4.254
After the Arab oil embargo in 1973 and the subsequent increase in the price of imported oil, the national goal became the achievement of energy self-sufficiently. The supply of domestic oil, however, is not adequate for future needs. The supply of natural gas, which is by far the fuel with the fewest environmental problems, is also in severe shortage. The uncertainty associated with nuclear power, such as the storage of nuclear wastes, increases the problems of nuclear energy. Most of the other alternatives, such as solar energy, are not yet practical for full-scale use.

4.255
According to the Federal Energy Administration's Project Independence study, the estimated coal supply is expected to increase from 685,017 (thousands of short tons) in 1975 to 895,000 in 1980. This, they believe, would be adequate for the electric utility industry, as well as all other users of coal. Production by underground and surface mining would be similar to present practices, but with increased production of western coals to meet low-sulfur standards. In addition, there would be an acceleration in surface mining in eastern areas, particularly in Southern Appalachia.

4.256
There are, however, disadvantages to using coal. Because of the past trend towards other fuels, rail, water, and motor carriers have not expanded their coal movement equipment and facilities. Existing rail service has declined or disappeared in many areas. Thus, a sudden increase in the use of coal could severely strain existing rail and water transportation, which may be inadequate, especially in the east. Moreover, even though coal resources may be available, suppliers of coal may not be.

4.257
Many environmental problems are also associated with coal. A principal problem is air pollution. Three pollutants for which national ambient air quality standards exist - sulfur dioxide, nitrogen oxides, and total suspended particulates - are emitted directly by

power plants. Long-term exposure to these pollutants may cause serious health effects as well as degrade the surrounding air. Coal also contains trace quantities of a variety of toxic elements which, in sufficient quantities, can also cause adverse environmental and health effects. In spite of the high efficiency of available control systems, the extensive volume of coal consumed in the United States makes coal combustion a major source of air pollution.

4.258
Another environmental problem associated with the use of coal is that of water pollution. Pollution from the surface mining of coal has already degraded thousands of miles of streams, affecting fishing and other recreational benefits. One of the most significant problems of coal-fired plants is coal pile drainage, which presents a potential danger of stream contamination if allowed to drain into waterways or seep into aquifers. This drainage can, however, be collected and neutralized, filtered, or evaporated to minimize the potential water pollution impact. In addition, land reclamation procedures, particularly integrated mining and reclamation, spoil grading, compaction, water treatment, and revegetation, can arrest much damage caused by coal mining.

4.259
Another major problem of coal-fired plants is the disposal of fly ash and scrubber sludge. Flue gas desulfurization produces large quantities of sludge, and separation of the water is difficult. Untreated, the sludge has the consistency of heavy mud, and may remain unstable even after drying. This may present a problem for both land use and water quality. Solid waste attributable to ash and sludge could come to over 75 million tons per year by 1980. However, ash and fixated sludge have sufficient compression to allow land reclamation. Deposits of these wastes can be covered with earth and revegetated. In addition, ash has been used as an additive to construction materials such as brick and road bed, although in limited applications.

4.260
There are many other potential impacts on the environment. Increased productivity in coal mining will cause some decline in productivity in other sectors. Land formerly used for agriculture and grazing would be diminished. Wildlife habitat could be limited or eliminated. Aquatic life could be greatly affected. Large quantities of land could be degraded from permanent land disposal of untreated sludge. Noise would be increased due to the transport, handling, and coal pulverizing equipment operation. Fugitive dust from coal handling and crushing could present a problem.

4.261
On the other hand, control programs can bring the coal use impact down considerably. Moreover, domestic coal utilization will have a positive impact. Additional jobs would be created. Transportation facilities would be improved. Most important, however, a decrease in the dependency on foreign countries for oil and their subsequent prices would be achieved. Balance of trade would be improved, with a resultant benefit to the United States economy.

Traffic Patterns

4.262
The incremental increase in traffic due to the 112-person operating staff will have no major adverse impacts on the local highway system. The new transportation plan for the operation and maintenance phase is to have coal delivery by unit train (of between 100 to 120 cars) five or six times a week. These increases, together with increased auto traffic, will proportionally increase the likelihood of accidents, as will the scheduling of trains during peak auto traffic hours.

4.263
Traffic queues will increase as a result of longer trains and more automobile traffic due to station employees in the immediate environs of the station. These are not expected to be a problem, but there will be longer waiting periods for the railroad crossings to clear. Longer traffic queues will probably occur at grade crossings east and west of the site as the trains approach the more urbanized, populated areas, e.g., Niagara Falls, Rochester.

4.264
Visibility is good at most of the railroad crossings in the vicinity of the site, with the exception of the small population nodes at Barker (Quaker Road), Appleton (Hess Road), and West Somerset (Hosmer Road) where buildings obstruct views of the railroad tracks. The speed limit is 30 mph at these crossings rather than 55 mph at other crossings in the vicinity to the east and west of the site.

Commercial Navigation

4.265
The location of the intake and discharge structures in the vicinity of the shoreline will nullify impacts on commercial navigation. The commercial channels are well offshore in the Somerset area.

Impact on Local Communities

Housing

4.266
Since many of the station's operation and maintenance staff will be relocating permanently into the environs, it is assumed that they will prefer to buy where housing is available rather than rent. The exact number of people that would be moving into any one town or village would be difficult to estimate due to location preferences, proximity to schools, shopping, etc.

4.267
Earlier discussions in the construction phase section indicated there is not a surplus of housing available for sale in the area of the station. This, in addition to indications that there will be no significant long-range increases in retail goods and services for the immediate station area, indicates that most of the relocating staff may relocate in the Lockport area where goods, services, and a variety of housing would be available.

Education

4.268
Most of the operation and maintenance staff will be permanently relocating into the immediate environs of the station from elsewhere in the county or from the western New York State region. Assuming that approximately 86 of the 112 workers will relocate, as was the case at the Ginna and Nine Mile Point plants, and assuming an average of 1.7 school-age children per family, approximately 146 additional children would be expected to enter the central school districts. As it is unlikely that these 86 families would all relocate within the same school district, it has been assumed that these students will be evenly distributed within each of the school districts. If, however, all the workers and their families should choose to relocate within the city limits of Lockport, the additional student enrollment could be accommodated into the current rated capacity of the school district with minimal impact.

Medical Facilities

4.269
No major impact is expected on the medical facilities of the local communities during the operation phase. The possible shortage of primary health care physicians in the area during the construction phase would not be a problem during the operation phase.

Fire Protection

4.270
The fire protection services in the nearby environs will meet the needs during operation of the station with no major difficulties. The additional families relocating into the area would have minimal effect on the sufficiency of these services.

Police

4.271
There may be a need to increase the manpower of the Niagara County Sheriff's Department during the construction of the station, but any increase would be on an as-needed basis. The operation of the station is not expected to require this increase in service. The additional families relocating into the area would have little or no effect on the sufficiency of these services.

Sewage

4.272
There will be adequate sewage treatment plants within a 20-mile radius to treat the additional sewage generated by the staff of the station, their dependents, and the projected population of the area. This statement is predicted on three assumptions:

- The operation and maintenance staff and their dependents will relocate within the station area and will choose to settle where housing, public facilities, and services are readily available.

- Assuming that the staff of the station and their dependents will total approximately 275 persons (assuming about one-third of the operating staff will come from the local area) and using an estimated figure of 120 gallons of effluent per day per capita, it is expected that the expected additional effluent generated will be approximately 33,000 gpd.

- All sewage generated at the station will be treated by a sewage treatment plant to be built by the applicant on the station site.

Water Supply

4.273
There are adequate water treatment facilities within 20 miles of the station to meet the potable water needs of the operating staff, their

dependents, and the projected population of the area. This statement is predicted on three assumptions:

- The staff and their dependents relocating within the station area during the operation phase will choose to settle where housing, public facilities, and services are readily available.

- Assuming that approximately 275 persons comprising the staff and their dependents (assuming about one-third of the operating staff will come from the local area) will use water at an estimated rate of 164 gpd per capita, it is expected that the additional demand for water will be 45,100 gpd.

- All potable water needs at the station will be met by a water treatment plant to be built by the applicant on the station site.

Solid Waste Disposal Facilities

4.274
Landfill will be the most feasible type of solid waste disposal in Niagara County during the operation of the Cayuga station. It is anticipated that the present solid waste disposal capabilities within 20 miles of the station will adequately handle the needs of the operation and maintenance staff and their dependents.

Recreation

4.275
Adequate recreation facilities will be available during the operation and maintenance of the station. The existing and proposed facilities should meet the future community needs as well as the needs associated with growth due to the operation and maintenance of the station.

The intake and discharge structures and piping have been designed to provide a 15-foot clearance, based on the controlled low lake level of 243 feet, so that navigational impacts or small recreational craft should be minimal. The submerged structures should be marked in accordance with U.S. Coast Guard specifications. Other impacts on recreational facilities include the station's aesthetic impact on area parks and Lake Ontario. The visual aspects have already been discussed in this chapter. Occasionally, during certain meteorological conditions, persons visiting area recreational facilities may be subjected to unpleasant odors from power plant emissions.

Growth

4.275a
Concerning the potential area growth that may occur due to increases in source personnel for major projects, an EPA contracted report ("Growth Effects of Major Land Use Projects: Volume III - Summary") is available which summarizes such effects. In this report, the area growth potential of a project is not conducted if the increase in source personnel due to the project alone is less than 2,250 people. Since the increase in source personnel both during construction and operation will be well below this value, the potential direct growth effects due to the proposed facility can be considered insignificant. Any indirect growth effects due to the proposed facility is also not anticipated to be significant. Secondary growth is not expected to have significant impact on air quality.

The construction and operation of any new source will to some extent affect the ambient air quality and subsequently may inhibit additional growth. Construction and operation of Cayuga Station is not expected to significantly affect future growth in the Somerset area.

Impact on Economy

4.276
The average number of employees and associated payroll during the first two years of operation and maintenance of the proposed facility is as follows:

Year	Number of Employees	Payroll
1984	112	$4,000,000
1985	112	$4,320,000

4.277
At the Nine-Mile Point facility, it has been estimated that the 50 to 55 employees who located in Oswego County would eventually support 33 to 37 jobs in the local, retail, and service industries (food handling, cleaning, clothing, entertainment, and similar industries). A very similar impact may be expected at the Somerset site, where the staff will consist of approximately 112 workers, compared to 71 at the Nine-Mile Point facility. The economic impact, however, may be slightly greater due to the improvements to the railroad.

Tax Revenues

4.278
The major fiscal impact of the proposed project in its operation and maintenance phase will be the generation of substantial property-tax

revenues. It has been estimated that by 1984 the applicant will pay over $6.4 million in property taxes annually. In 1975, the site produced $16,757 in taxes. Owing to the way in which property taxes are distributed in New York State, the tax benefits received from the proposed project will be spread far beyond the boundaries of the town of Somerset. Table 4-20 illustrates the potential implications associated with the addition of the proposed facility to the tax rolls.

4.279
The long-term economic effects from the increased property tax base will be significant. These economic benefits may be in the form of decreased property tax rates while property values increase and/or significant increases in local community services, e.g., improvements or additions to schools, recreation facilities, etc. In the case of the Robert E. Ginna facility, the property value within the town tripled in the span of three years.

New York State under present laws does not levy special utility taxes to compensate for cost increases to local Government and consequently special districts will not receive funds from this source.

Both Building Aid and Operating Expense Aid will be reduced. However, the Barker Central School will continue to be eligible for transportation aid. The aid that is lost will cause an additional property tax levy but with minimal impact as the applicant will be funding over 90 percent of the school tax levy, which will allow budgetary increases without increasing the individual taxpayer burden. Taxes contributed by assessment of the plant will be paid to local taxing bodies in the following manner:

Niagara County	- $3,046,000
Town of Somerset	- 180,000
Barker Central School	- 3,185,000

Barker School District is estimated to lose $1.5 million in State aid but this is more than offset by the increased revenues supplied by the power plant.

Estimated tax rates with and without the proposed plant are presented below:

	With Somerset	Without Somerset
County Tax	$6.15	$ 7.81
Town Tax	.01	5.18
School Tax	.61	48.15
Total	$6.76	$61.14

As the applicant will pay over 90 percent of the school levy, any increase in levy due to a loss in State aid will be borne almost enitrely by the station.

It is expected that all tax-supported services in the area would be maintained but that the funding for these services would fall chiefly on the applicant rather than on the State.

TABLE 4-20
ESTIMATED PROPERTY TAXES[1/]

Year	Property Tax Payments ($)
1980	286,000
1981	1,018,000
1982	2,178,000
1983	5,406,000
1984	6,411,000

1/ These estimated payments are approximate figures and are based on current Real Property Tax Laws, assessing procedures, and practices. Property taxes on the land at the Somerset Site are not included in the above estimated tax payments.

Annual Income of the Utility

4.280
The applicant is unable to realistically project the estimated annual revenue from the proposed facility because the rate structure at the time of station operation cannot be predicted at this time.

Impact on Air Traffic Patterns

4.281
There are no airports, seaplane bases, or airport control zones within one-mile of the proposed site boundaries. Two Federal airways, however, pass within close proximity of the site. Airway V34 south is a low altitude airway with a minimum altitude of 5,000 feet between Rochester, New York, and the vicinity of Toronto, Canada. The centerline of airway V34 south passes through a point 0.3-mile southwest of the station center. Since airways are generally eight

nautical miles wide (four nautical miles on either side of the centerline), a portion of V34 south passes over the station center. Airway J522, a high-altitude airway (18,000 to 45,000 feet) between Syracuse, New York, and Toronto, Canada, passes at its closest point, approximately nine miles north-northeast of the station center. Since the minimum altitude of both airways is greater than 5,000 feet and the height of the plant stack is only 450 feet, the station will have minimal impact on these airways.

4.282
The plant stack will be equipped with aircraft warning beacons as required by the Federal Aviation Administration. High-intensity strobe lights are most commonly used in current new applications. These flash in very short white bursts at a frequency of 40 per minute, with all lights synchronized. There will probably be three levels of lights, with four equally spaced on each level. They will operate at 200,000 candelas in the daytime, 20,000 candelas in the intermediate twilight and dawn periods, and 4,000 candelas at night. Recent designs exhibit sharp light dispersion cutoff on an adjustable horizontal plane. To date, the applicant has not secured a "No Hazard" determination from the Federal Aviation Administration.

ENVIRONMENTAL IMPACT OF TRANSMISSION LINE OPERATION AND MAINTENANCE

Maintenance of Right-of-Way

4.283
Maintenance of the right-of-way will require selective control of vegetation. This will be accomplished by mechanical and chemical means as may be most appropriate. Herbicides used will be only those approved for such use by appropriate State and Federal agencies, and applied in quantities recommended by the manufacturer. Such chemicals will be applied only by certified personnel on a selective basis and in a manner preventing pollution of any watercourse, wetland area, or abutting property. The right-of-way will be examined for potential erosion problems, and if any are observed, remedial action will be undertaken as appropriate. The access roadway should require no attention other than vegetative control to permit continued use by maintenance vehicles. Where the right-of-way crosses cropland, the applicant will attempt to schedule normal maintenance activities during the nongrowing season. Existence of the cleared right-of-way and permanent excess roads may lead to adverse impacts on soils, vegetation, and wildlife from destructive intruders such as hunters, motorcyclists, snowmobilers, and recreational vehicle owners.

Environmental Impacts

4.284
When designing and constructing the transmission facilities required for the proposed generating station, control of operational impacts of the line will be of major concern. The impacts of induced current shocks, audible noise, radio noise, ozone generation, and low-level electric fields are described in the following paragraphs.

Shock Hazards

4.285
Electric and magnetic fields produced by transmission lines can induce voltages and currents in conductive objects near the line, making possible the conduction of shock currents through persons who are grounded and touch such objects. Objects that are large enough to have a potential significant effect include metal objects such as buildings, roofs, fences, and pipes, as well as vehicles operating on the right-of-way or on roads and highways crossed by the proposed lines. The shock hazard associated with fixed metal objects near the proposed lines is minor. Factors such as distance from the conductors, dimensions of the object, and grounding inherent in the object's structure reduce the practical hazard to a low level. Investigation of the size, location, and construction of objects near the right-of-way will enable the applicant to determine if a potential hazard exists. If it is determined a potential hazard does exist, grounds can be installed and maintained. If grounding the object would interfere with its operation, other protective devices such as filters on electric fences can be used.

4.286
The shock current associated with vehicles under the line will be held below hazardous levels by use of appropriate conductor clearances above roads or ground. Minimum clearances will be greatest where the line crosses roads, since use of the road by larger tractor-trailers is assumed. Clearance over fields will be adequate to control shock currents from agricultural equipment.

Noise and Radio and TV Interference

4.287
Audible noise generated by the proposed 345kV lines during the periods of fair weather will be well below the rural and suburban nighttime ambient L_{50} noise levels near the lines. Line noise, therefore, will generally be unnoticeable under fair weather conditions, which prevail for at least 75 percent of the time in the project area.

4.288
Depending on the severity of the weather, audible noise levels during periods of foul weather are predicted to range from 40 to 52 dBA at a point 50 feet from the outer conductor. Weather conditions causing noise levels in the higher portion of this range are rare, and noise caused by the proposed lines will be partially masked by the noise caused by the rain striking the ground, foliage, and buildings. Line noise may be noticeable during fog or snow, on rare occasions when ice forms on the conductors, and for a period after rain. Foul weather conditions of varied intensity prevail for less than 25 percent of the time in the project area.

4.289
Line noise is attenuated by three to four dBA for every doubling of distance from the line. Noise levels will be further decreased by about 15 dBA if a person is in a building with the windows open and by about 30 dBA if the windows are closed. Noise from the proposed lines will have no effect on the normal activities or sleep of persons living near the line.

4.290
Typical fair weather AM radio interference levels due to corona on the conductors at a frequency of 1 Mhz, will be 37 db above 1 uV/m at a location of 50 feet and 39 dB at 200 feet from the outer conductor.

4.291
These interference levels generally have not caused objectionable radio reception. The quality of reception at an AM radio receiver is influenced by a number of factors such as acceptable signal-to-noise ratio in relation to the program material, seasonal and atmospheric variations in signal and noise levels, condition of the receiver and antenna, conductor aging, ambient audible noise near the receiver, and station broadcasting frequency. No complaints concerning AM radio interference caused by operating 345kV lines have been received by the applicant, although these lines are located in several areas of weak signal reception. If an objectionable condition is reported, the applicant will investigate and correct the problem. Gap-source interference to AM radio reception may be caused by damaged or loose hardware on the line. If such conditions develop, the applicant will locate and correct them.

4.292
Amplitude-modulated radio noise, of which transmission line noise is one example, generally has no effect on frequency-modulated radio reception. The applicant has not received and does not expect to receive any complaints concerning frequency-modulated radio interference.

4.293
Television reception may be affected occasionally by operation of the proposed lines. Television interference may develop when hardware is loose or damaged. If such interference is reported, the applicant will locate and correct the problem. Television interference caused by foul weather corona on the conductors may occur when attempting to receive weak signals in the lower VHF spectrum (Channels 2-6) at a location within 100 feet of the right-of-way edge. The applicant will investigate such cases, and will correct interference with a usable signal by upgrading the antenna system.

Ozone

4.294
Minimal amounts of ozone and nitrogen oxides can be generated by corona discharges produced by 345kV transmission lines. This occurs primarily during periods of foul weather. During fair weather, corona activity decreases drastically and ozone generation becomes insignificant.

4.295
Extensive research on the effects of ozone generated by high voltage lines has shown that no measurable increases of ozone concentration could be detected at ground level under 345kV lines. Tests conducted over a 12-month period by IIT Research Institute, Chicago, Illinois, showed no difference between ground level concentration of gaseous oxidants at a station located amid six 345kV lines and at a control point located 2.1 miles away. Based on such studies and on the operating experience of the applicant and other utilities, it can be assumed that the proposed transmission lines will make no measurable contribution to the ambient ozone level. Therefore, based on the national primary air standards for oxidants, the operation of the proposed transmission lines will have no measurable influence on air quality. Ozone generated by corona discharges produced by 345kV transmission lines will have no measurable effect on vegetation, animals, or man.

Electric Field

4.296
The electric field produced by the proposed lines will have no effect on the normal activities of persons on the right-of-way. With the exception of shock currents from charged objects, as previously discussed, the presence of the field will not be noticeable. The maximum ground gradient (electric field strength at one meter above ground in the absence of any perturbing conductive body, expressed in kilovolts per meter) of the operating lines will be less than one-half of the threshold of perception, which is the gradient that is

considered to be the lowest field strength at which a person might detect the field by skin sensation. The conclusion that there will be no effect on normal activities is supported by the occurrence of the variety of activities, particularly agricultural, that are practiced on 345kV transmission line right-of-way in many parts of the United States.

4.297
Research has been conducted concerning the subtle biological effects of the 60Hz electric fields associated with power lines, and further research is underway. The Public Service Commission of the State of New York is holding hearings that address this question. To date, no harmful effects from exposure to electric fields produced by 345kV have been demonstrated.

4.298
Based on the above mentioned facts and on experience, the applicant does not plan to initiate any procedures that would minimize the use of the right-of-way by the general public. The applicant will restrict the changing of grades or other activities that would reduce clearance to conductors, and will prohibit the construction of buildings on the right-of-way. These policies, however, are long-standing, and are related to public safety and line security.

Bird Collisions

4.299
Although bird kills from collisions will undoubtedly occur, there is not sufficient evidence upon which to base annual estimates of such occurence nor to indicate whether threatened or endangered species might be involved. Portions of the proposed transmission corridor are in the vicinity of diving duck and Canada goose fall migration corridors (Great Lakes Basin Framework Study, 1975). Possible waterfowl deaths could be expected from collisions with towers and transmission lines, especially during foul weather conditions. These losses should be relatively insignificant to the bird populations of the region. The spacing between conductors and between conductors and ground is such that the possibilities of electrocution are negligible. It is the applicant's opinion that the impact of the maintenance and operation of the proposed facilities on bird populations will be insignificant.

CHAPTER 5 - ANY PROBABLE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

INTRODUCTION

5.001
Implementation of a project on the scale of the Cayuga Station at Somerset will result in unavoidable environmental, social, and/or economic consequences that might be considered undesirable. In the following paragraphs, the most undesirable consequences of the construction, operation, and maintenance of the proposed facility are discussed.

LAND USE AND SOCIOECONOMICS

5.002
The station will change the setting of a portion of the site from rural to industrial. Of the 963 acre site, the facility will require about 50 acres of land to be permanently committed and an additional 106 acres of land to be used only during construction. The area to be permanently committed to the facility includes approximately five acres of woodland, less than two acres of deserted orchard, four acres of fencerow, 18 acres of open field, and 21 acres of active agricultural land. Temporary construction areas will occupy 24 acres of open field and 82 acres of active agricultural land. All temporary construction areas will be included in the site restoration plans as will other portions of the site where visual screening, noise screening, or erosion control are required.

5.003
Total agricultural land on the Somerset site in August 1975 was 539 acres with a total annual value of approximately $157,000. After site restoration, which includes extensive planting of trees, shrubs, and grasses, as much as 435 acres could be used as active agricultural land, depending on lease agreements. If all 435 acres are planted, there would be a net loss of approximately 100 acres. This loss of agricultural land would result in a 20 percent reduction of the 1975 value of $157,000 (equaling a $31,000 potential loss per year). The disturbed land area will result in the loss of the use of prime farmland soils. Approximately 94 percent of the soils on the site have been classified as prime farmland.

WATER QUALITY

5.004
The operation of the station will add a certain amount of water pollutants to Lake Ontario. Treatment operations will reduce the quantity and concentration of materials in the liquid wastes to such levels that the resultant discharge will be in compliance with

Federal effluent requirements. The combined station discharge (cooling water and treated liquid waste effluent) is expected to be in compliance with New York State surface water quality standards at the point of discharge, provided, of course, that the ambient lake water withdrawn as cooling water satisfies these standards. Discharge characteristics for pertinent water quality parameters from routine operation and maintenance prior to combination with cooling water discharge (99.9 of total discharge) are presented in Table 1-13 (Chapter 1).

5.005
The once-through cooling water system will discharge 235,000 gpm of thermal effluent at a design temperature rise of 35°F above the temperature of the water taken into the plant. The annual mean increased evaporation loss from Lake Ontario caused by the station will be 9.95 cfs. The maximum induced surface temperature rise will be 4.2°F and will only occur within the initial jet mixing region as described in Chapter 1. The State has identified a 3°F isotherm to encompass a maximum surface area of 15 acres, which has been determined acceptable. Adverse biological effects from the thermal plume are considered to be minimal.

AIR QUALITY

5.006
The adverse environmental effect associated with air quality which cannot be avoided is some deterioration of air quality in the region due to the plant's emissions. Major impacts on local air quality from construction would be fugitive dust, vehicular emissions, and on-site open burning. Major operational impacts on air quality would be power plant emissions. These include increased concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2, hydrocarbons and total suspended particulates (TSP). All emission rates are expected to be within the allowable Class II nondegradation limits. These emissions will occur throughout the projected 30-year operating life of the plant.

5.007
One adverse environmental effect addressed in Chapter 4 that is not within the scope of the present ambient air quality standards is the potential contribution to "acid precipitation" due to facility emissions of sulfur oxides and nitrogen oxides. At the present time it does not appear possible to establish an identifiable relationship between the regional ecological implications of acid precipitation and the emissions of any one point source such as the proposed facility. However, a very small contribution to the regional problem of acid precipitation should be recognized as a potentially unavoidable environmental impact of the proposed facility, since the facility

will burn high-sulfur coal and the FGD system will provide only 80-90 percent removal. Additionally, FGD systems reduce but do not eliminate SO_2 emissions and tall stacks tend to distribute emissions over a regional area.

AESTHETICS

5.008
Construction of the station will result in the creation of visually imposing structures which may be considered aesthetically unpleasant. Architectural and landscaping treatment of the station will minimize adverse aesthetic impacts.

NOISE

5.009
The following unavoidable noise impacts have been identified: transportation; blasting; initial cleaning of steam lines; and setting and testing of safety valves. Vehicular traffic including trucks and blasting have been discussed previously in this report. Another transportation noise source is movement of coal trains to the station. Currently, no trains use the tracks near the site. The movement of a unit train to and from Somerset would cause a 12 to 16 minute noise exposure of 78 dBA at 25 feet from the tracks.

5.010
Two unavoidable noise impacts, initial cleaning of pipes and setting of safety valves, both result from the release of high pressure steam to the atmosphere. The resultant noise will sound like a rumble similar to the noise from a large jet taking off in the distance. The noise will occur for about one minute and will have a source power level around 178 dB re 10^{-12} watts. The initial cleaning of the steam pipes occurs once during the life of the station and will have a total duration of approximately 40 minutes. Setting of safety valves is an early event which could have a duration of up to 1-1/2 hours.

RESOURCE CONSUMPTION

5.011
Operation of the proposed Cayuga Station will require from 2,400,000 to 3,167,000 tons of coal per year, depending on the applicant's final selection for coal supply. In addition, 67,000 barrels per year of No. 2 distillate oil will be consumed and 230,000 tons of limestone per year will be consumed for the FGD operation. Energy resources in support operations such as mining and materials shipping will also be consumed.

5.012
Though the proposed facility's coal consumption is large in absolute terms, it is insignificant compared to total available U.S. and world resources. Available U.S. resources are estimated to be adequate to supply U.S. needs for one to several centuries, depending on projections of future energy and organic chemical demand. Social and environmental constraints on total energy use have been suggested as more important constraints on the long-term use of coal than is depletion of coal reserves (Ford Foundation, 1974). Thus, any impact of the proposed plant consumption is likely to be insignificant in scale.

5.013
It is estimated that the operation of the proposed station will result in the consumption of 0.4×10^8 cubic feet of water per year for potable and service water requirements, FGD system makeup, and forced evaporation at the lake's surface caused by the thermal discharge.

AQUATIC ENVIRONMENT

5.014
An area of 8,733 square meters 94,000 square feet) will be excavated for the intake and discharge pipeline. The volume of the dredged material will be 7,000 cubic yards of sand and silt and 21,000 cubic yards of rock. The 94,000 square feet impacted makes up less than 0.1 percent of the area of similar habitat in the vicinity of the site. Pertubations from construction will displace benthic organisms within the immediate vicinity of the proposed structures. Turbidity will inhibit phytoplankton and to a lesser extent zooplankton productivity. These effects will be transitory in nature and ultimately have minimal adverse impacts.

5.015
Operational activities will affect aquatic ecology in several ways. Potential sources of impact include entrainment of aquatic organisms, impingement of juvenile and adult fish, thermal discharges, and loss of aquatic habitat. Entrainment and impingement effects will be ameliorated to a degree by locating the intake structure in an area of low biotic density and the use of a velocity cap and screens.

Entrainment losses for phytoplankton range from 9.95×10^{12} cells per month in December to a high of 1.15×10^{14} cells per month in May. Zooplankton losses are estimated to range from 2.33×10^9 organisms per month in December to 6.33×10^{11} organisms per month in August. Total ichthyoplankton losses are estimated to be over 1.6×10^7 per year (over 275,000/year equivalent adult losses). Heaviest losses would be sustained by alewife (over 92 percent) and rainbow smelt (one percent) while nearly seven percent will be unidentified.

5.016
Impingement losses will also be dominated by alewife, which is expected to account for 92 percent of the projected 2.9 million fish per year impinged. Rainbow Smelt are estimated to account for roughly three percent while the remaining five percent will be made up of over 50 species known to occur in the area. Detailed information is presented in Table 4-8.

5.017
Thermal plume effects are anticipated to have minimal adverse impacts on aquatic ecology. Planktonic productivity will be inhibited in the area defined as the jet mixing zone, however, no significant changes in growth rates or shifts in population dominance are expected. Benthos will be affected by the thermal discharge only while the plume is in contact with the bottom which would involve a zone with a radius of approximately 15 feet at each of the nine discharge ports, a total loss of less than 0.5 acres. Nektonic organisms generally have the ability to avoid and detect areas of high temperature and currents.

Consequently, losses due to the thermal plume are expected to be negligible. A detailed discussion of thermal plume effects is presented in Chapter 4, Biological Impacts.

TERRESTRIAL ENVIRONMENT

5.018
The probable adverse environmental effects on the terrestrial environment which cannot be avoided are the loss of vegetation (natural and agricultural) and wildlife habitat as well as subsequent reduction in the number and diversity of wildlife species in areas where stabilized sludge/ash disposal and coal pile areas will be situated.

The plant species and cover types to be disturbed or removed are common to the Somerset site region. The five acres of woodlands removed represent about 0.06 percent of the 58,700 acres of the commercial forestland in Niagara County. Wildlife associated with shrub and woodland cover types will lose about 40 acres of vegetative cover. The loss of wildlife will not be significant on a regional basis, and for most species the loss would be difficult to measure. No endangered or threatened animal species will be affected.

TRANSMISSION CORRIDOR

5.019
The principal impact of the proposed facilities will be the conversion of about 50 acres of forest land to low-growing species and herbaceous cover. The impact on the remaining acreage will be limited

to that from grading and other actions associated with construction. Almost all of these lands will be allowed to revert to their former uses following construction.

5.020
The proposed transmission lines will result in some visual impact. The areas affected will generally be a relatively narrow band along the corridor. These impacts will be experienced for the life of the proposed facilities.

5.021
As a result of transmission line clearing and construction, some wildlife habitat disturbance or destruction and some wildlife mortality will result. Following construction, the reestablished vegetative community may benefit wildlife through increased diversity. Total impacts on area populations and systems are expected to be minimal.

CHAPTER 6 - ALTERNATIVES TO THE PROPOSED ACTION

INTRODUCTION

6.001
The purpose of this chapter is to set forth the presently available alternatives to the proposed action. The alternatives encompass a wide range of economic, environmental, and social concerns and can be categorized as follows: alternatives not requiring the creation of new base load generating capacity; alternative power sources; alternative sites; and alternative plant designs. Several of these alternatives are deemed to be viable and applicable options to the proposed action. Other feasible alternatives are not considered preferable to the proposed action due to economic, social or environmental concerns.

ALTERNATIVES NOT REQUIRING THE CREATION OF NEW BASE LOAD GENERATING CAPACITY

"No Action" Alternative

6.002
The "no action" alternative would occur if the applicant did not take any steps to provide additional power by construction of new capacity (base load, peaking, or cycling units), purchase or transfer of electricity, upgrading of old plants, or delaying the retirement of existing plants. Therefore, the "no action" alternative places reliance on present peak load capacity to meet future demand. The demand for power from the applicant's system and from the New York Power Pool is projected to rise to a point where present generating capacities will be unable to supply adequate power reserves. The consequences of inadequate reserves would be an increase in the frequency and severity of service disruption, with accompanying economic losses and social inconveniences. Further, the applicant is obligated to supply adequate electrical power to the customers within its service area and to maintain sufficient reserve capacity. The alternative of "no action" would violate this obligation to the applicant's customers and would be contrary to contractual arrangements with member companies of the New York Power Pool (NYPP). This alternative has been rejected as being impractical.

Purchased Power

6.003
The amount of capacity available for purchase is dependent on the timely completion of new units. Recent acknowledgment of slippage in the schedule for the proposed facility and for Jamesport 1 and 2, together with a lack of significant progress in the certification and

licensing of PASNY's 700 MW fossil, Greene County and Prattsville plants, support a position that potential excess capacity within the New York Power Pool (NYPP) during the early to mid-1980's has a high probability of not materializing. It would also be incorrect to assume that all excess NYPP capacity would be available solely to the applicant. Likewise, load growth rates higher than those presently projected could exhaust the capacity excesses presumed to be available for purchase.

6.004
In early 1976, the applicant conducted a survey of neighboring systems external to NYPP to determine the availability of potential purchase capacity. Responses from General Public Utilities and Pennsylvania Power & Light Company indicated some excess capacity, provided construction of new units proceeded on schedule; however, this excess would first be offered to Pennsylvania/New Jersey/Maryland Interconnection (PJM) utilities. A recent communication to the applicant from Northeast Utilities likewise indicated some available excess capacity; however, this excess was contingent upon completion of future nuclear facilities on schedule, and available only after other New England Power Pool members had turned it down. Also, the available excess is from an intermediate fossil unit and not base load capacity.

6.005
In light of recently announced cutbacks in construction plans, Ontario Hydro expects to be deficient in generating capacity in the early 1980's; therefore, excess capacity would not be available from this system.

6.006
The applicant's need is for base load capacity, and any generating capacity available for purchase is generally non-base load type. A seller normally sells capacity from its least efficient units which are, in general, gas turbines or other high-production cost units. It is particularly uneconomic when such units must be used for base load service. The applicant has concluded that base load capacity in the amount required to preclude the need to build the proposed facility will not be available on a continuing firm basis.

Reactivation or Upgrading of Older Units

6.007
The applicant has only one retired unit of approximately 32 MW capacity and it was being studied to see if it could be economically reactivated in accordance with air and water quality regulations. The study was not completed and is now inactive. Retirement or reactivation of this unit would not affect the projected need for the

Somerset station. Also some 678 MW of existing coal-fired units are being examined for possible increases in ratings. At best, if economically and environmentally feasible, no more than 70 MW of additional capacity could be obtained from these existing units. It is highly improbable that such an increment is available and of the 678 MW of existing capacity being examined, 10 units, totaling 485 MW will be more than 30 years old by 1983. Although these units are presently in good operating condition and the applicant has no current plans to retire any of them, a major component failure or a modification imposed for environmental reasons could necessitate reconsideration of this present position. The applicant has no peaking units which could be considered for conversion to base load operation. All of its older coal-fired units are operable as base load or intermediate facilities.

Conservation and Demand Reduction

6.008
The applicant has an active and continuing program to promote energy conservation to minimize future load growth. The load forecast methodology and the resulting forecast previously stated reflect these ongoing efforts. The Energy Efficiency Program initiated by New York State Electric & Gas Corporation in 1973 was continued and expanded in 1976. During the past year, however, there has been a major shift from emphasis on immediately achievable energy use reduction to a more substantive long-range reduction and a basic improvement in public energy use patterns. Two surveys covering approximately 4,000 of the applicant's electric and gas customers revealed that people are aware of the need to conserve energy and almost all have taken some of the easily accomplished steps to reduce their energy usage. A lower rate of growth in electric energy use on a per residential customer basis can, in part, be credited to energy conservation as well as the desire to reduce costs.

6.009
To accomplish a long-range reduction in energy use, a more intensive effort has been made in 1976 to promote adequate insulation in new and retrofitted homes and new commercial construction, and in the reduction in peak demand among larger industries. In addition, a Load Management and Pricing Committee is investigating the possibilities of using electronic equipment to control certain customer loads. It is also reviewing plans and programs of other utilities through personal and Edison Electric Institute contacts.

Internal Programs

6.010
An internal organization of energy conservation coordinators, established in 1973, continues to monitor energy use in applicant facilities and to recommend structural improvements or modifications to equipment or control systems where appropriate to effect future energy savings. Building operating procedures are periodically reviewed to assure continued adherence to established energy management practices and to evaluate alternative operating procedures. The following is a summary of activities and accomplishments to attain the objectives in energy conservation and energy management among residential customers during 1976.

6.011
A variety of publications were made available to the public through distribution to group meetings, office literature displays, bill inserts, personal visits, building material suppliers, and exhibits at large group events, such as home shows and county fairs. Among these publications are revised and updated booklets on home insulation, and choosing and using an electric water heater.

6.012
A two-week advertising campaign on home insulation was conducted during the month of September. This included advertisements in 14 daily and 65 weekly newspapers and spot announcements on 22 radio stations throughout the service area. This publicity, along with a bill enclosure, resulted in 5,000 requests for information on home insulation. This distribution of publications is as follows:

- How to Save Energy in Your Home	15,350
- NYSE&G Insulation Handbook	25,000
- Basement Insulation and Moisture Control	13,500
- Residential Appliances and Energy	7,400
- Choosing and Using an Air Conditioner	1,600
- Choosing and Using an Electric Range	1,300
- Choosing and Using a Dishwasher	2,450
- Choosing and Using an Electric Water Heater	9,500
- 33 Ways to Winterize Your Home	6,000
- Farm Quarterly Newsletter	20,000

6.013
New York State Electric & Gas Corporation maintains throughout the service area a staff of experienced personnel who consult with and advise residential customers. During the year 11,323 requests were received for information on home insulation, heat loss control, energy conservation, and electric service. Where required, a total of 7,597 field follow-up visits were made as a result of the

requests. A program begun in 1973 of working with community organizations on home winterization was continued and expanded during the year. Largely funded by Community Service Administration and State funds, the applicant's participation in the program is that of serving as an advisor on technical matters. The applicant's employees also serve on several qualification review committees. Under this program, approximately 1,500 homes have been winterized.

6.014
Although there appears to be considerable apathy on the part of the general public toward the need for energy conservation, there is a genuine desire on the part of many citizens to learn more about the energy situation. This concern is reflected in the number of requests received for presentations to groups on energy subjects. In 1976 there were 268 presentations made before a total of 14,925 people, a substantial increase over 1975. The applicant's Market Services personnel will continue to actively solicit opportunities to talk to community organizations.

6.015
Applicant personnel have continued throughout the year to advise and consult with builders and developers, building material suppliers, and insulating and heating contractors. A major effort has been made, especially with builders and heating contractors, to educate these tradesmen on the proper sizing of space heating equipment for residential use. During the year, 5,289 contacts were made with these business establishments.

6.016
During the year, the applicant has participated with an exhibit featuring home insulation in five regional shows, including home trade and county fairs. These events provided an opportunity to reach a large number of people. Total attendance at the five shows is estimated to be 375,000.

Commercial, Industrial, and Public Authority Programs

6.017
Market Services Department Energy Engineers and Commercial Representatives continue to contact industrial, commercial, and public authority customers, both individually and through group presentations to encourage improved energy management practices. Under a long-range program, all customers with a demand of 60 kw or more are being individually contacted to discuss energy conservation measures and, where applicable, demand control applications. An attempt is made to identify specific actions which the customer can take to effect energy savings and/or demand reductions.

6.018
During 1976, a total of 1,644 contacts were made with these customers, including 429 new customer contacts. Of these, 167 customers completed action programs to reduce energy use. Examples of the energy management actions implemented are as follows:

- A large industrial customer with an existing automatic demand control system, upon a review of the plant electric loads, was able to include more than 1,000 additional small motors under the controller with a significant decrease in demand and energy consumption.

- At a nursing home, incandescent lighting was replaced with fluorescent, reducing the lighting energy requirements by more than two-thirds for those fixtures converted.

- At a college, a reevaluation of lighting requirements resulted in the removal or disconnection of over 11,000 fluorescent tubes, 2,000 ballasts, and 1,000 incandescent fixtures. In addition, more than three hundred water coolers were disconnected to save additional energy. Overall energy savings of several hundred kw and several hundred thousand kwh are expected.

School Programs

6.019
Long-range changes in energy use patterns can probably be best accomplished through the education of young people. New York State Electric & Gas Corporation is continuing and expanding the school program begun in 1973. Through personal contacts and group meetings with educators, the need to include energy subjects in the school curriculum at all grade levels has been emphasized. The applicant provides teacher resource materials in the form of a curriculum guide, energy word puzzles, and slides and films on energy conservation. In addition, four energy museums have been operated in as many applicant facilities. These museums have been visited by students primarily in the intermediate grades on a regularly scheduled basis through the 1976 school year and, on occasion, during the summer months.

6.020
In the Fall of 1976, a general newsletter on energy subjects directed to school administrators was instituted as a regular feature of the program. In 1977, a series of fact sheets on energy subjects will be made available to school teachers and plans are underway to organize

workshops for grade school and science teachers. A summary of school presentations by applicant personnel is as follows:

In-school Presentations	79
Energy Museum Presentations	151
Number of Students Participating	14,500

6.021
The Market Research Group has continued the study that was begun in 1974. In addition, the group is monitoring the electric consumption of large customers for rate design, and studying the effects of solar energy and heat pump installations on the applicant's system load. Also, heat storage systems used in conjunction with these and conventional resistance heating systems are under investigation.

6.022
Despite the various energy conservation programs, the applicant is engaged in, these will not eliminate the need for the proposed facility. The actual contribution of the "conservation ethic" in reducing demand is questionable at this time. Additionally, the applicant's demand projections already incorporate conservation effects.

Rate Modifications

6.023
Alternative rate structures can be designed to reduce peak consumption and consequently needed capacity. For instance, the rates for industrial and commercial sales can incorporate rate tariffs in which a demand charge serves as an incentive to reduce monthly peak load. The rate would also encourage high monthly load factors and discourage seasonal variations. Although this would reduce peak demand, the applicant's deficiency is projected in base load capacity.

6.024
The institution of a demand charge applied only to daytime loads may encourage industrial customers to use electricity during off-peak nighttime hours. Labor resistance and wage premiums would constitute the foremost obstacles to an industrial customer's shifting a major amount of usage to nighttime hours; and for a commercial enterprise, such a shift in operations outside of conventional business hours would be infeasible. Other rates which are aimed at reducing peak load are also possible. However, these would not eliminate the need for additional base load power.

6.025
Other means of encouraging conservation through rate structures include: conservation incentives for residential customers designed

to provide lower rates for customers using less than a designated number of kilowatt-hours per month; and interruptible load contracts. Residential conservation rates would require approval by the NYS Public Service Commission (NYSPSC). The PSC rejected a similar proposal by the Niagara Mohawk Power Corporation since the suggested rate would not allocate costs fairly among residential users and higher use customers would be subsidizing lower use customers. Interruptible load contracts are generally attractive only to industries such as basic metals (steel and aluminum) where batch process operations are used.

New Non-Base Load Capacity

6.026
New capacity may be designed for either base load or non-base load operation. The additional generating capacity needed by the applicant to satisfy projected demand is of such a magnitude that the capacity should be base load type.

ALTERNATIVE POWER SOURCES

6.027
A number of alternative methods of power generation were considered based on their reliability, lead-time, and availability. The following is a discussion of each alternative method was which evaluated by the applicant as a possible means of power generation.

Oil

6.028
Combustion of oil is a commercially proven alternative for the generation of base load power. Presently, this method supplies less than one percent of the applicant's generating capacity (Table 1-1). The combustion of oil is undesirable from both an availability and a national iterest viewpoint due to uncertainties in long-term supplies and the enactment of the Energy Supply and Environmental Coordination Act of 1974. This Act was promulgated for the purpose of reducing the United States escalating dependence on foreign imports to meet its energy demands. It grants authority to the Federal Energy Administration to prohibit power plants from burning petroleum products as their primary energy sources.

Natural Gas

6.029
From an environmental viewpoint, natural gas is the preferred fossil fuel, since the combustion-related emissions of particulate matter and oxides of sulfur are significantly less than those generated by

other fossil fuels. Also, gas-fired generation units require the least complex equipment, and require lower construction and operating costs. The combustion of gas for the generation of base load power would contravene the Energy Supply and Environmental Coordination Act of 1974. For this reason, the use of natural gas in the proposed station is not considered a viable alternative.

Nuclear Fission

6.030
Nuclear Fission is considered a viable alternative to the use of coal in powering base load generating capacity. Economically, the methods are comparable with a nuclear plant having a higher capital cost but an offsetting lower fuel cost. In comparison with coal-fired plants, nuclear units could have potentially more environmental impact from the standpoint of liquid discharges, consumptive water use, effects on aquatic biota and possibly, natural resource utilization. A light-water nuclear powered plant was initially considered by the applicant for the proposed Somerset site. However, due to the longer projected lead time to bring a nuclear facility on line, a coal-fired plant was considered more feasible to meet the current needs of the applicant.

Nuclear Fusion

6.031
Controlled thermonuclear fusion is still in the early development stage. In fact, the critical stage where more energy is produced than consumed has yet to be demonstrated. Optimistically, commercial production demonstration is not expected till the late-1990's.

Nuclear Breeder Reactors

6.032
The breeder reactor is presently being developed by industry and various national governments, including that of the United States (through the Energy Research and Development Administration). Demonstration breeder reactors are already in operation abroad. However, commercial application of the breeder within this country is dependent upon creation of a nuclear fuel reprocessing industry and favorable resolution of public Policy questions about the handling of plutonium fuel. Commercial application of the breeder is not expected before 1990 and, therefore, cannot meet the demand which the Cayuga Station units are intended to fulfill.

Hydroelectric

6.033
According to the Federal Power Commission (1972), the underdeveloped capacity of river basins in New York State is not sufficient to supply 850 MWe of base load generating capacity.

Gas Turbine, Diesel Generators, and Pumped Hydro-Storage

6.034
These three alternative power generation methods would be unsuitable because they represent peak load capacity and not the base load type capacity required to meet the applicant's projected power needs.

Geothermal

6.035
This energy source is presently being developed in Europe and on a limited basis in specific areas of the U.S. In this country, only the dry steam geothermal system has been demonstrated to be economical. However, shallow geothermal sources capable of large scale base load power generation are not found in New York State.

Solar Energy

6.036
Techniques for the conversion of solar energy to electric power have been proposed and are currently being investigated. At the present time, this technique is feasible for small-scale applications, such as heating and cooling of individual homes. However, because of the intermittent nature of solar energy, until a low-cost method of energy storage can be coupled with solar units, this type of production will remain unsuited as a source of base load power. For this reason, solar energy was deemed inapplicable as an alternative method.

Wind Energy

6.037
Since New York State appears to have some relatively favorable sites for wind generation, this alternative at some point in time may prove to be a viable means of producing base load generating capacity. However, like solar energy, wind energy is intermittent and would necessitate a system of energy storage. Viewed from a reliability standpoint, a large-scale wind generation system is infeasible given current technology. For this reason, wind energy can be rejected as an alternative method.

Coal Gasification and Liquefaction

6.038
Production of liquid and gaseous fuels from coal has been accomplished in the past. Numerous technical problems remain to be solved before this technology can be deployed on an economical scale. It is likely that when such fuels become available, they will be preempted by market forces or public policy for uses now requiring oil or natural gas. In addition, the desirability of first processing coal into liquid or gaseous fuels--with the associated environmental, economic, energy, and social costs--and then burning the products to produce electricity rather than burning the coal directly is questionable at best.

Municipal Solid Waste

6.039
For large-scale base load generation, the use of this resource would be as a supplemental fuel due to its low heat content. Collection of burnable wastes from a substantial area around the station site would be costly and would provide only a small percentage of the necessary fuel.

Magneto-hydrodynamics

6.040
Magneto-hydrodynamics systems are presently being researched. There is potential for high efficiency generation with low environmental costs. However, technology does not exist today which would allow reliable generation by this means.

Electrogasdynamics

6.041
Electrogasdynamics generating systems are also being researched now. Again, technology does not exist today which would allow reliable generation by this means.

Combined Cycle Systems

6.042
A combined cycle plant is one in which the waste output of a gas turbine plant is used as the primary energy source (supplemented by additional fuel combustion as necessary) of a conventional steam plant. Since such plants involve use of gas turbines, they are best suited to operation as intermediate units rather than the base load units presently needed by the applicant. Additionally, its use depends on a reliable supply of oil or gas, the long-range availability of which is uncertain.

Fuel Cells

6.043
Commercially-sized fuel cells are being developed by the Niagara Mohawk Power Corporation and others in the electric utility and related industries. As now anticipated, prototype units for testing purposes may be available in 1978. Based upon favorable results of the testing as well as advances in technology, fuel cells may become feasible for providing base load electric power in future generating units. They cannot now be relied upon to provide an alternative for a base load unit scheduled to come on-line in the mid-1980's.

Others

6.044
There are a number of other means of generating electrical power which are not considered technically feasible for base load generation in New York. These include bioconversion, oil shale, waves, tidal energy, thermionic devices, and ocean thermal gradients, all of which are in various stages of research and development. Although some of these sources may be applicable in the future, it is unlikely that energy sources such as waves, tides, and ocean thermal gradients will be considered realistic in the applicant's service territory.

ALTERNATIVE SITES

Alternative Generating Sites

6.045
The site selection process was initiated approximately twenty years ago with two potential sites (the Cayuga and Somerset sites) emerging from a screening process that initially focused upon engineering, economic, and socioeconomic factors, and then involved a determination of compatibility with environmental factors.

6.046
Prior to April 1956, the applicant served its customers in the western portion of its service area with Power purchased from Niagara Mohawk Power Corporation. In April 1956, an agreement with Niagara Mohawk was revised so as to call for the applicant to provide power to its western area from its own generation. Because the plans for the development of the Niagara River were unknown, and because of the relatively high growth rate in the western area, the applicant began efforts to find land suitable for a base load power plant site on the shores of either Lake Erie or Lake Ontario.

6.047
Initial screening efforts were guided by selection factors that emphasized:

- Cooling water availability.
- Access to transportation routes.
- Relative ease of power transmission to load centers.
- Minimal competitive pressures on land and waterfront resources
- Foundation conditions.

6.048
The Lake Erie shoreline from Buffalo westward past Dunkirk was first studied by inspection of topographic maps. This review of the maps proved to be discouraging due to the highly developed shoreline. The Lake Erie shoreline was then visually searched and a few locations were found to have limited open shoreline. Due to the highly developed nature of the Lake Erie shoreline, it was decided to search the Lake Ontario shoreline before proceeding further with site searches on Lake Erie.

6.049
On the Lake Ontario shoreline, the area east of Olcott was found to be much less developed than the shoreline of Lake Erie. Closer inspection disclosed that the shoreline of the area near Olcott contained extensive cottage development. Also, Lake Road, which roughly parallels the shore, was very close to the shore near Olcott, leaving insufficient room for a power plant. However, eastward of Olcott, Lake Road diverges from the shore and is 3,000 feet from the lake at the NewfaneSomerset town line. Further eastward, the road is 4,000 feet inland with access to the railroad about 7,000 feet away. This location was identified as the Somerset site.

6.050
In the mid-1960's, NYSE&G undertook a statewide survey of New York State to determine possible locations for a nuclear power generation plant. This survey used several criteria for the basis of site selection, which were:

- Access to cooling water for direct cooling.
- Access to rail transportation.
- Access to transmission lines.
- Suitability under AEC siting criteria.
- Remoteness from neighboring land uses which might be inconsistent with a power plant.

6.051
As a result of this survey, an area located on the southeast side of Cayuga Lake was identified as a prime site for a future power station. This location was designated as the Cayuga site. The proposed power plant site consists of 915 acres of land located between Cayuga Lake and Lake Road (Route 34B). It is bounded on the north by Cuddedack Road and on the south by Milliken Road. At the site, Cayuga Lake is approximately 1.75 miles wide. The terrain rises from the lake shore to an elevation of about 418 feet within one mile. Land use in the vicinity of the site is essentially agricultural and the area is of low population density. The acreage within the site consists of 453 acres of cropland and pasture, 35 acres of inactive agricultural land, 207 acres of forest brushland, 110 acres of forest land, and 109 acres of open fields and agricultural land that will be disturbed for plant construction. This project site had been previously considered for a nuclear power plant designated as the Bell Station and areas of the site had been disturbed and excavated at that time. This site met all the above criteria and had the added advantage of being located near the center of the applicant's service area, where it was expected the major growth in electricity demand would take place.

6.052
The suitability of both the Somerset site and the Cayuga site is supported by work conducted independently by the New York State Atomic and Space Development Authority (ASDA) in 1971-1972 which identified areas within New York State as suitable siting areas. ASDA identified the following areas:

- The shore of Lake Erie and the Niagara River within New York State except for the Buffalo-Niagara Falls Metropolitan area.
- The shore of Lake Ontario within New York State except for the vicinity of Rochester and Oswego.
- The shore of the St. Lawrence River within New York State except for the vicinity of Ogdensburg and Massena.
- The shores of Lakes Seneca, Cayuga, and Oneida.
- The western shore of Lake Champlain except for the vicinity of Plattsburgh.
- The Hudson River south of Poughkeepsie and north of Tarrytown except for the vicinity of Newburgh, Beacon, and Peekskill.

- The shore of eastern Long Island.

- Offshore sites in Long Island Sound, Lower New York Bay, and the Atlantic Ocean off Long Island and Staten Island.

6.053
Both the shores of Lake Ontario and the shores of Cayuga Lake were identified by ASDA as prime candidate regions for locating power plant sites. The ASDA studies led to New York State identification and investigation of sites within these areas for future power growth. These included sites on Lake Ontario identified as Morrison, Sterling, and Wilson. The Somerset site was identified, but was excluded because it was already under the ownership of New York State Electric & Gas Corporation.

6.054
The site selection and qualification period leading to the New York State Article VIII application has been marked by an evolving regulatory program for introducing more detailed ecological considerations into the siting process. As a result of the continuing ecological studies which were conducted, the New York State Public Service Commission and the New York State Department of Environmental Conservation have recommended that the Somerset location be considered the more environmentally compatible site. New York State Electric and Gas, in an effort to expedite the siting process and avoid delays which would lead to power shortages, has joined with the NYSPSC and NYSDEC in recommending the Somerset site to the New York State Board on Electric Generation Siting and the Environment.

ALTERNATIVE PLANT DESIGNS

Alternative Cooling Systems

6.055
The applicant has evaluated alternate cooling systems for the Somerset site. A summary of these evaluations is presented below.

Cooling Pond

6.056
A cooling pond for the proposed generating facility would require an area of approximately 1,000 acres to effectively dissipate the heat load. The applicant feels that acquiring an additional 1,000 acres is impracticable and could conflict with existing land use. In addition, a cooling pond would require chemical control, i.e. the addition of scale, corrosion, and biological inhibitors. Because of evaporative losses, it would be necessary to continually withdraw water from the lake. A final item considered was the effect of the

cooling pond on neighboring groundwater supplies. To eliminate seepage of concentrated and chemically treated lake water into groundwater, it would be necessary to provide a "sealed basin" cooling pond.

Spray Canal

6.057
A spray canal was also considered as a possible alternative. The canal would require approximately 50 acres with a "sealed basin" similar to that necessary for the cooling pond. In addition to those problems discussed for the cooling pond, a spray canal would present some fogging, misting, and icing conditions resultant of water droplet dispersion.

Dry Cooling Towers

6.058
Dry cooling tower performance is optimized when turbines capable of attaining back pressures as high as 14 inches Hg_a are available. However, current domestic designs are limited to operation at approximately 5 inches Hg_a maximum operating pressure and short-time duration operation at approximately 8 inches Hg_a. Currently, there are no dry towers in operation in this country for the unit size contemplated at the Cayuga Station at Somerset. The costs of dry cooling systems range between three to four times the cost of other conventional evaporative cooling tower systems. The reasons for this increase are the result of higher operative costs due to the auxiliary power requirements and the decreases in plant efficiency due to larger turbine back pressures. Environmentally, this is the most favorable method due to the small amount of makeup water required and the lack of a visible plume. Due to the engineering and the economic requirements, this method has been found to be impracticable by the applicant. The impact of cooling towers on migrating birds are contained in paragraph 6.066a.

Natural Draft Cooling Tower

6.059
This cooling water system is a closed-cycle natural draft evaporative cooling tower system. Cooling towers are designed and constructed to accommodate anticipated cooling water demands. Cooling towers with recirculating condenser cooling water systems would require continuous makeup water to replenish water losses through evaporation, drift, and blowdown. Blowdown is essential to maintain water quality parameters within desirable limits. Optimization of makeup and blowdown quantities from both engineering and environmental viewpoints results in a recirculating condenser cooling water system

operating at two or more cycles of concentration. Makeup water requirements would be supplied from Lake Ontario. The applicant estimates a blowdown rate of 6,480 gpm and a drift rate of 17 gpm if a cooling tower were constructed. The withdrawal of lake water for cooling tower systems is lower than for once-through cooling. This tends to greatly reduce the impact on aquatic organisms by impingement and entrainment. Additionally, thermal impacts on aquatic biota are reduced by use of cooling towers.

6.060
Various environmental impacts of a natural draft tower plume have been analyzed by a computer program utilizing Rochester surface meteorological data and tower emission characteristics. For various locations in the site area, the program calculated the impact due to the rise and dispersion of both water vapor and drift. For five years of weather observations, only one observation resulted in a prediction of increased fogging, and one observation in increased icing. Thus, virtually no increase in natural fogging or icing conditions is predicted due to natural draft towers. The maximum solids deposition rate is predicted to be 5.5 kg/km^2/month (2.5 km kilometers northeast of the site). The Visible plume length from natural draft towers is predicted to be less than 5 kilometers about 99 percent of the time on an annual basis. Cooling towers at Somerset could also create a potential hazard for migrating birds. This is discussed in greater detail in paragraph 6.066a.

Mechanical Draft Cooling Towers

6.061
Mechanical draft cooling towers are dependent upon induced draft fans to draw ambient air into the tower whereas in the natural draft tower the air flow is induced by the chimney effect created by the lower density moist warm air rising through the hyperbolic cooling tower shell. There are two types of mechanical draft cooling towers: a rectangular design and a round design. Fogging and icing potential with either type is greater than with a natural draft tower because neither possesses the plume rise of the natural draft tower.

6.062
Mechanical draft cooling tower plumes were considered with a similar cooling tower model as used for natural draft tower plume. The maximum number of hours of increased fog offsite is predicted to be 8 hours per year (at 1 kilometer from the tower), and the maximum increase in offsite icing conditions is predicted to be 5 hours per year (within 2 kilometers of the tower). Additionally, a potential for a maximum of 440 hours of onsite fogging per year is noted. The maximum solids deposition rate is predicted to be 1540 kg/km^2/month

(within 400 feet of the towers). The visible plume length is predicted to be less than 5 kilometers more than 99 percent of the time on an annual basis. Inconvenience of human activity from fogging due to mechanical draft towers should be confined primarily to the site.

Plume Abatement Tower

6.063
The plume abatement tower reduces the level of fogging which is associated with mechanical tower systems. This is accomplished by the incorporation of dry cooling sections which slightly reduces the amount of water vapor released to the atmosphere. There is still some degree of low level fogging associated with this system. Economically, the plume abatement towers are more expensive than the natural draft tower design.

Wet/Dry Cooling Tower

6.064
The wet/dry cooling tower system is a variation in design of the plume abatement system previously discussed. However, where the plume abatement system is designed principally to minimize the extent of visible plumes, the wet/dry system is designed both to reduce consumptive water use by the towers and to reduce the formation of visible plumes. This type of system is more expensive than natural draft towers and for this reason, it was determined to be impracticable by the applicant.

Natural Draft vs. Mechanical Draft Towers

6.065
The natural draft cooling tower is preferred over the mechanical draft wet and wet-dry cooling towers by the applicant for the following reasons:

- It will require less maintenance.
- It causes minimal increased icing and fogging.
- It has the lowest solids deposition rate.
- It is the quietest system of the three cooling tower systems.
- It eliminates mechanical and electrical components of fans.

The main drawback of the natural draft cooling tower is its size. Its height of 390 feet and top diameter of 270 feet present a hazard to birds flying around the perimeter of Lake Ontario.

Ahditional Noise Considerations

6.066
The replacement of the once-through cooling system with a closed cooling system would result in approximately double the noise emission from the station. If a natural draft or mechanical cooling tower is used, the noise at the nearest plant boundary would be in the 60's dBA. A natural draft cooling tower would produce the lowest noise in the community and mechanical draft towers would be about 2 dB noisier at the same distance. There are no silenced cooling towers of the type that would be used for the station in operation in this country; only much smaller towers have been silenced. If silencing can be instituted, it could more than double both the cost and energy consumption of the closed cooling system which uses the cooling towers. Spray canals and/or ponds would produce a much higher noise level in the community, and silencing is not feasible. Dry cooling towers would be the noisiest and would produce a very objectionable noise level in the community. To date, no feasible silencing of dry cooling towers has been proposed.

Avian Mortality

6.066a
The construction of a cooling tower at the Somerset site could create a potential hazard for nocturnal migrating birds. At the Somerset site, the natural draft cooling towers would be 390 feet high, the mechanical draft wet towers would be 59 feet high, and the wet-dry towers would be 69 feet high. Bird kills mainly occur during spring and fall migration when weather is unfavorable (low clouds, fog, and rain), although some have occurred on clear nights.

The major migration periods for many birds through the Somerset site area are from April through May and August through September. The potential for bird collisions is greatest when environmental conditions favorable for major movements of migrants (i.e., the passage of a warm front in the spring or the passage of a cold front in the fall) coincide with atmospheric conditions that prevent or interfere with visual orientation by birds (e.g., overcast skies and fog). The illumination of towers with high-intensity flashing light to comply with Federal Aviation Administration regulations may reduce collisions; on the other hand, birds may be attracted to steadily illuminated objects such as ceilometers, towers and lighthouses. There are numerous reports of kills as birds strike on or near the lights.

Bird collisions involve variables such as structure height, illumination, type of structure, weather, time of year, surrounding terrain, and location. While there have been kills reported, there is no

conclusive information available concerning cooling towers and the effect cannot be predicted with any degree of certainty.

Kills at Davis-Besse cooling tower on Lake Erie occurred during a period when the tower was being constructed and the tower and/or the reactor building were flood-lighted. This illumination may have contributed to the kills and not be typical of kills at towers in general. The Davis-Besse Site is similar to Somerset being on the shore of a large lake. Many birds may fly around instead of across Lake Ontario and therefore the number of birds exposed to a tower would be limited. Waterfowl migrate during daylight and, therefore, should be able to avoid the tower.

The use of a natural draft cooling tower at the Somerset site could cause some bird mortality while the mechanical draft wet towers or the wet-dry towers would cause considerably less.

Once-Through Cooling

6.067
The applicant considers a "once-through" cooling system to be the most attractive since:

- The capital and maintenance costs of cooling towers can be eliminated.
- Higher steam cycle efficiency will result in less fuel consumption and less atmospheric release of residual contaminants, as well as a saving in fuel costs.
- No corrosion or scale inhibitor chemicals would be required, eliminating a potential chemical impact on the aquatic environment.
- No fogging, misting, or icing problems would occur.
- No biocide usage is required eliminating biocide impact on the aquatic environment.
- Land usage would be optimized and natural resources committed would be minimized.
- No acoustical problem would be created.
- A minimal evaporative loss of lake water would take place.
- Potential for impact on bird migration is reduced or eliminated.

- The once-through system assures the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife in Lake Ontario, thus cooling towers appear to be excessive mitigation.

- No contamination of local groundwater would occur.

The increased total costs and operation and maintenance cost over once-through cooling for alternative cooling systems at the Somerset site are as follows:

Method of Cooling Utilized	1983 Total Costs	O&M[a] (costs in mills per kWh)
Induced Draft Mechanical Cooling Towers	$35,000,000	.04
Wet-Dry Induced Draft Cooling Towers	$41,000,000	.04
Natural Draft Hyperbolic Cooling Tower	$ 5,000,000	.03

[a] Based on 69.8 percent levelized capacity factor, one mill/kWh is approximately $6 million in annual cost.

Intake Systems

6.068
One primary factor in determining the design of the intake system is the source of water. This source must be capable of supplying the amount of water required to reliably meet plant demand. Three possible sources include groundwater, onsite surface water, and Lake Ontario. However, because groundwater and onsite surface water could not be withdrawn in adequate amounts, Lake Ontario is considered the only feasible source to supply the plant's water demands.

6.069
The intake system at the Somerset site has been designed in accordance with Federal and State criteria, and incorporates features which make it environmentally more acceptable than available alternatives. First, in considering an onshore or offshore intake, it was apparent from biological data that the higher concentrations of organisms would be avoided if the structures were placed offshore. Second, in order to avoid both benthic fauna and fish concentrations found on or near the bottom, the actual intake port has been elevated a distance of 5 feet off the bottom. Third, as recommended by the EPA and in order to minimize the impact on the environment, the

structures were designed with a velocity cap and an intake velocity of 0.5 fps. Once the decision to locate offshore had been made, there were few acceptable alternatives to this design. To locate nearer to shore would have impacted an area of high biological activity; the depth was needed to maintain proper navigational clearance. The chosen design will incorporate a fish return system (Ristroph or similar type screen) to reduce mortality from fish impingement or low velocity intake screening (Johnson screens on a similar design).

The depth selected minimizes adverse impact on the aquatic environment in that it avoids areas of high biological activity and value. Placement of the intake structure at a depth greater than 25 feet:

Avoids impact on littoral fish popualtions.

Avoids impact on littoral spawning and nursery areas and reduces the potential for ichthyoplankton impingement.

Precludes impact to the habitat former (macro-algae) community which is located inshore of 20 feet.

Reduces potential impact to the littoral benthic macroinvertebrate community.

Placement of the intake structure at a depth less than 40 feet:

Effectively precludes any impact on blue pike, an endangered species in Lake Ontario.

Reduces potential interaction of deepwater fish and benthic macroinvertebrate communities with the intake.

Precludes any potential for nutrient pumping.

In summary, the location selected minimizes the impact on aquatic life and moving the intake into shallower or deeper water increases the above-mentioned impacts.

6.070
Corps staff has reviewed various types of shoreline intakes such as intake channels dredged in the lake bottom and jetty-protected intake canals. Dredged intake channels tend to result in entrainment of high numbers of organisms and littoral drift settles in the channel resulting in the need for constant maintenance dredging. This type of system is not reliable and is environmentally unsound. Intake canals protected by jetties also withdraw water from a biologically sensitive area, require constant maintenance dredging, and are not

reliable. Additionally, these structures intercept littoral drift and can cause downdrift erosion.

6.071
Corps staff also reviewed the proposed intake structure. The offshore location, the velocity cap, relatively low intake velocity and capacity, height of the intake above lake bottom, and the fish return system will all tend to minimize the impact on aquatic organisms. However, staff recommends that the design incorporate a system which would allow hookup to a new intake structure further offshore if biological monitoring during station operation shows a need for such relocation and the applicant is required to do so by a Federal or State agency. A possible design method would be to include a valved on blind-flanged stub in the intake pipe design.

6.072
Alternate water transport systems (tunnels, piping) were evaluated and based on engineering and economic considerations, submerged piping proved to be the most favorable solution. Ice floe protection is achieved by the maintaining of a considerable depth of water over the system. Alternatives to reduce impingement are discussed in paragraphs 6.082 through 6.084a.

Alternative Discharge Systems

6.073
Various discharge design alternatives were studied in view of Federal and State thermal discharge standards. The major design alternatives involved in the discharge design were either surface or submerged discharge. For a submerged discharge, the choice involved: (a) tee diffuser, (b) staged diffuser, or (c) oblique diffuser.

For a staged diffuser, values for the following parameters were considered:

T_o = Condenser temperature rise
H = Water depth
h = Height of the ports above the bottom
$_o$ = Discharge velocity
L = Diffuser length
= Horizontal angle of ports
N = Number of ports
= Vertical angle of ports

The primary sources of information on the performance of the various potential designs was a nearfield physical model study and an analytical farfield study, both performed by the R.M. Parsons Laboratory for Water Resources and Hydrodynamics of the Department of Civil

Engineering at the Massachusetts Institute of Technology. The following sections describe the choices leading to the final diffuser design which was made on the basis of the protection and propogation of the balanced indigenous population of fish, shellfish, and wildlife in and on the lake.

Surface vs. Submerged Discharge

6.074
The model study investigated surface discharges located both at the shoreline and at an offshore point. For the following reasons, it was concluded that a surface discharge would be less desirable than a submerged diffuser:

- Both surface discharge designs resulted in induced temperature rises significantly larger than any of the submerged diffuser designs tested.

- The offshore surface discharge requires the construction of a diked channel that could potentially cause significant interruption of natural longshore sediment transport.

- Ambient biological data indicate that the offshore region in a water depth greater than 25 feet is less sensitive than the inshore region.

- The diffuser design essentially negates the possibility of winter cold shock losses by denying fish access to a discharge canal in which they could establish residency.

Staged vs. Tee vs. Oblique Diffuser

6.075
The major conclusions based on a comparison of relative performance are:

- The difference between the performance of the designs during times of zero cross current is small, with the tee diffuser achieving slightly greater dilutions than a staged diffuser of the same length.

- The performance of the staged diffuser improves with increasing magnitude of receiving water current.

- The performance of the tee diffuser decreases with increasing magnitude of receiving water current.

- The performance of the oblique diffuser increases when the receiving water current is the same direction as the discharge and decreases when the current flows in the opposite direction.

The Somerset site is characterized by time varying moderate (0-1-foot per second) currents primarily in the longshore direction. The prevailing current direction is eastward, but westward currents are commonly observed approximately 20 percent of the time. On this basis, it is clear that the performance of a staged diffuser, measured in terms of the worst case situation for each diffuser type, with respect to the effect of receiving water current, will be superior to both the tee and oblique designs. For this reason, the staged diffuser was judged to be the best design choice for the Somerset site.

Condenser Temperature Rise, Water Depth, and Height of the Ports Above the Bottom

6.076
These diffuser parameters were chosen primarily on the basis of potential biological impacts, and are outlined below:

- In general, a higher ΔT was considered more desirable as long as the thermal impact of the diffuser was acceptable. The higher ΔT decreased the volume of water utilized by the station, thus minimizing entrainment and impingement losses.

- Densities of aquatic organisms were lower in offshore regions (in water depths greater than 25 feet), making this region more desirable for the intake and discharge structures.

- The discharge ports were located above the bottom sediment to reduce thermal impacts on organisms associated with the bottom.

Discharge Velocity

6.077
This diffuser parameter was chosen primarily on the basis of the design considerations. Excessively high velocities would create jet forces in the ports which would require substantial structural supports for the diffuser piping. The design discharge velocity of 15 feet per second represents a viable figure, both from the structural and hydraulic points of view.

Diffuser Length

6.078
One of the principal parameters that varied in the model tests was the diffuser length. For a staged diffuser, the maximum induced surface temperature decreases with increased diffuser length. In general, the temperature distributions resulting from diffusers with lengths between 100 and 800 feet were judged to be acceptable from the point of view of environmental impacts. It was clear, however, that while the 400-foot diffuser performed measurably better than the 100-foot diffuser, the 800-foot diffuser did not represent a significant improvement over the 400-foot case.

Horizontal Port Angle

6.079
This diffuser parameter was investigated carefully in the model study. In general, the results indicate that the effect of γ on diffuser performance is small and dependent upon the magnitude of the ambient current. Observations made of the model runs tend to indicate that at low (near zero) current speeds, a diffuser with $\gamma = 25^{o}$ performs slightly better than a diffuser with $\gamma = 0^{o}$. The opposite result is observed with a moderate to strong current. Because the worst case performance of the staged diffuser is during stagnant receiving water conditions, it was concluded that a horizontal port angle of 25° would be the desirable choice for the Somerset site.

Number of Ports and Vertical Angle of the Ports

6.080
A combination of navigational clearance, economics, and pipe stresses played a role in the selection of these parameters. The model tests indicate that for N greater than 5 the diffuser performance does not depend upon N. A small number of large diameter ports presents problems both in clearance and stresses. A large number of small diameter ports has a significant effect on the economics of the diffuser. Nine ports represent a compromise between these considerations which does not affect the performance of the diffuser as a whole.

From extensive previous investigation, it is known that the effect of α upon the diffuser performer is negligible for α less than 20°.

Condenser Cleaning Alternatives

6.081
Two alternatives were considered for online condenser tube cleaning at the proposed station; a mechanical tube cleaning system such as

one made by Amertap and a chemical system involving the biocide, chlorine. The mechanical system has the advantage of reducing the amount of chlorine needed in the chemical system, thereby reducing the adverse environmental effects of the biocide. Because of the abrasive action of silt in Lake Ontario, the use of a chemical condenser tube cleaning system will not be necessary, and the adverse environmental effects of chlorine can be avoided. A mechanical system is proposed to be used, although the specific type of mechanical system has not been selected.

FISH RETURN SYSTEMS

6.082
Methods of alleviating potential fish entrapment by fish diversion and return systems include: an onshore screenwell (louver) fish diversion system; an offshore intake fish diversion system; a transportation system to return bypassed fish safely; Ristroph traveling screens; and low velocity, uniform-flow screening as in Johnson Screens or a similar design.

6.083
A louver system is essentially a row of vertical slats placed across an intake channel or canal. The slats are constructed at a specified angle and lead to a bypass system. The system works on the principle that fish will seek out areas of low velocity. The areas of low velocity lead to a bypass. These systems may be able to operate at almost 90 percent efficiency. This system would still require a conventional screen behind the louver system to remove debris from the cooling water. The louver system can also be adapted as an offshore diversion system. It would be installed within the intake pipeline and would divert fish to a fish return pipeline. Angled screens and louvers combined with fish bypasses were considered in selecting the fish return system. Each of these systems was found to be selective for species which orient into the current. In addition, the effectiveness of the louver system at removing or guiding fish is dependent on both the size of the fish being guided and on the louver spacing and thus must be designed to a target species and size. The fish bypass would require an increased cooling water flow rate which would in turn increase the number of organisms taken into the plant and then subjected to handling in addition to increasing operating costs.

Further, the louver system may require conventional screening between the louver and the pumps which would increase the intake system cost. All of these systems would require larger intake facilities and result in higher initial and operating costs. However, the applicant plans to design the forebay of the pumphouse so that if the intake structure does not perform as expected, there is space to accommodate

the later installation of louvers and a fish bypass system. Additionally, the use of angled screens as an alternative to Ristroph screens or similar fish conservation screens is the subject of Article VIII Stipulation Number 74-2.

6.084
Another method is to use conventional vertical traveling screens but to angle the screens so that they guide fish to a bypass system. Ristroph traveling screens or "fish conservation screens" are modified traveling screens with troughs to gently lift fish caught on the screens and gently wash them off for transport back to the receiving waterway. The applicant is considering Ristroph screens or a similar type fish return system. Unlike the previous alternatives, Ristroph traveling screens depend on fish impingement. Onshore louvers, Ristroph screens, and angled traveling screens are generally more effective than louvers offshore. Corps staff believes that the applicant should evaluate the alternative systems to determine the most environmentally acceptable and cost-effective fish return system for the Cayuga Station.

6.084a.
Surface water intake screens represent another intake design alternative intended to eliminate debris from intake cooling water and reduce fish entrapment. In this alternative, screening would be installed at the intake port itself. Basically, three types of screens or barriers could be placed across the intake openings: perforated plates; stainless steel wire mesh, and; most recently, uniform flow screens constructed of "V" shaped wire on vertical rods. Screens over the port openings could prevent fish and debris from entering the intake system along with the intake waters. Perforated plates have a very low percentage of open area and thus have distinct disadvantages. These plates would be susceptible to clogging by debris and frazil ice (small needle-like ice crystals which can adhere to metal surfaces) and are difficult to backwash because the large amount of dead area reduces backwash efficiency. Additionally, intake velocity would have to be greatly increased if perforated plates were used to screen the intake ports. Staff does not believe that perforated plates are a viable alternative to the proposed intake design.

The use of stainless steel wire mesh screens at the intake ports has been considered as an alternative to the proposed design. Stainless steel screens, with properly sized mesh, would reduce fish impingement. The smaller the mesh, the more effective the screen. The disadvantage of the screens are their cost and the operational and maintenance difficulties and costs occasioned by their clogging.

Several results would occur as the consequence of placing stainless steel at the intake openings in an attempt to reduce fish impingements. These include operational problems occasioned by clogging of the screens; increased intake velocity due to the reduced available flow area; and increased costs associated with screen installation and maintenance and provisions for cleaning the screens. Cladophora growth is present on the bottom of the lake at the Somerset site. When these algae break off in mass, it is possible that the algae and debris could accumulate on the screens and diminish or completely shut off the water flow. If the screens were not cleaned, the clogging would cause a plant shutdown.

The basic cleaning problem is access and maintenance. A method of resolving this problem is backwashing. A source of backwash water flow would have to be installed to wash the debris off the screens. It is also possible that any debris removed might have to be collected rather than returning it to the lake, either for environmental reasons or simply to avoid the potential for the reclogging of the screens with the material washed off. Such a condition would require additional equipment. All mechanical items (i.e., valves and pumps, etc.) would have to be inspected and serviced on a regular basis, at least, if not on an as needed basis as occasioned by the clogging. During a period when significant amounts of cladophora were being impinged, it may require the constant presence of operating personnel such as divers to clean the screens.

The screens would also be susceptible to ice buildup and blockage in winter. If required, coarse mesh bars normally located at intakes can be heated by various methods to preclude or remove ice buildup. These methods, such as electronically heated bars, would not be appropriate for the small mesh screens needed to keep fish out of the intake. To alleviate ice problems, the use of screens only during nonwinter months has been considered. However, it would be a major undertaking to remove the screens for the winter.

The capital cost of the system has not been estimated in detail by the applicant. However, the backwash system could be an expensive alternative, costing in excess of one million dollars.

In addition to the capital costs, the system would require different degrees of operator attention which would add to the overall cost of the system.

The question of the increased velocity caused by clogging of the intake would not be significant until the velocity became sufficiently high such that fish pulled gainst the screen could not escape. In that case, a larger intake area would be needed.

However, increasing the size of or number of intake portals is probably the most expensive alternative method of addressing an intake portal screen clogging problem. Additional portals assumedly diminishing velocity would be subject to clogging also, thereby compounding the extent of the problem.

Although screening would reduce fish impingement, the additional maintenance costs, chronic operating problems, and equipment costs associated with this type of screening may not be warranted.

The third alternative is uniform flow screens such as those manufactured by Johnson UOP, Inc. or similar type screens which produce nearly uniform flow. Uniform flow screens are generally most effective from a biological and engineering standpoint when they are constructed in a cylindrical shape rather than as a flat screen. However, even a flat screen can be designed to cover port openings and produce nearly uniform flow characteristics. These screens have relatively little dead area. This allows for efficient backwashing and means that entrance velocity can be kept low while still maintaining high intake capacity. The use of "V" shaped wire for uniform flow screens produces a smooth surface and this tends to minimize clogging of the screens by water-borne materials. When particles, including aquatic organisms, are trapped against the screen, they tend to be washed away by natural currents since the intake velocity is relatively low and the smooth surface has little resistance. However, some cleaning may eventually be needed.

The ability of uniform flow type screens to protect fish, fish larvae, and fish eggs from impingement and entrainment while still supplying the necessary intake water requirements is the subject of ongoing research. Preliminary studies show that impingement may be greatly reduced since these screens produce a nearly uniform flow of low enough velocity to allow most fish species trapped on the screen to escape or be washed away by natural currents. The smooth surface may also minimize abrasive injuries associated with many standard wire mesh screens. Research is currently being performed on uniform flow screens produced by Johnson UOP, Inc. at the McNerry Dam in Oregon. This research is being performed by the U. S. Army Corps of Engineers and the National Marine Fisheries Service.

The screens can be manufactured with openings as small as 0.25 mm and properly designed screens show promise of reducing entrainment of fish eggs and larvae. Demonstrations using scale models in test flumes indicate that the screens may be able to reduce impingement and entrainment of fish eggs. To date there are no known operating power plant intake systems which utilize uniform flow type screens over the intake ports. Due to the lack of operational data, Corps staff cannot conclusively state that these screens would protect aquatic organisms while reliably providing a source of power plant

intake water year round. However, staff does believe that screens of this type may be a viable solution in reducing the impingement of most adult fish.

WASTE HEAT UTILIZATION

6.085
The proposed facility is a fossil-fueled power plant with a design thermal discharge of 528 cfs at a T of 35°F above ambient. The heated effluent from the facility's once-through cooling system has theoretical potential for use in both agriculture and aquaculture. A complete ecological, economic, and engineering evaluation of a broad range of potential uses of the heated effluent has been made by the applicant. The applicant concluded that the advantages of using waste heat would be negligible. There is little probable benefit to the use of the effluent for irrigation purposes as the region presently receives adequate rainfall. The farmland in the immediate vicinity of the site is utilized for pasture and crop production and the relatively short growing season (May to October) might be lengthened by irrigation with thermally enriched water. The probable economic benefits of growing season extension appear to be outweighed by pumping and irrigation costs and the fact that the zone presently receives adequate precipitation.

6.086 Other possible uses of the heated effluent including aquaculture and greenhouse and animal pen heating were deemed unfeasible on economic and/or ecological grounds. While suitable land and lakeshore area is available for such endeavors, considerable capital outlay would be required, including emergency heating equipment and sewage treatment facilities. Temperature control in greenhouse, aquaculture and forced growth through pen heating is critical and the effect of scheduled or unscheduled shutdowns of the power generation facility would be economically disastrous to waste heat users if emergency heating equipment was not available. Additionally, both aquaculture and pen heating projects would require sewage treatment facilities to avoid increased nutrient injection into the lake waters. Failure to provide such facilities would increase the potential for eutrophication of Lake Ontario.

In summary, waste heat utilization at the Somerset site is not considered economically feasible or ecologically desirable by the applicant in view of:

- Costs involved in delivering effluent to areas suited for aquaculture and agriculture.
- Costs involved in providing emergency heat sources.

- Costs associated with waste disposal to prevent premature eutrophication as result of nutrient injection.

ATMOSPHERIC EMISSION CONTROL SYSTEMS

Electrostatic Precipitator

6.087
The appropriate control technology for particulate matter is electrostatic precipitators. The applicant proposes to utilize electrostatic precipitators with approximately 99.7 percent collection efficiency. However, alternative particulate control systems such as bag filters are becoming more established and have decided advantages in use with certain low sulfur coals. Depending on the conceptual design, coal selection, and BACT requirements, bag filters may prove to be the preferred or required method of obtaining high particulate removal efficiencies.

Nitrogen Oxide Control

6.088
Emissions of nitrogen oxides (NO_x will be controlled through boiler design. Boiler manufacturers guarantee that NO_x emissions from their boilers will meet and comply with the standard of 0.7 lb/MBtu of NO_x as (NO_2). The boiler design incorporates dual register burners, provisions for overfire air, and a burner zone net heat release rate of less than 500,000 btu/hours per square foot. Since the boiler design will effectively limit the formation of NO_x, no other alternative control measures were considered.

Sulfur Dioxide Removal

6.089
Sulfur dioxide reduction may be accomplished by implementation of boiler construction based on fluidized bed combustion techniques. The fluidized bed principle has been used extensively in the petroleum and chemical process industries. However, it has only been in recent years that substantial effort has been expended to develop the fluidized bed combustion process as a technique for burning high sulfur solid fuels, while maintaining stack emissions within the EPA limits. In theory, the combustion of solid fuels can be economically accomplished in a fluidized bed of limestone while controlling SO_2 and NO_x emissions below the limits established by the EPA. The fluidized bed combustion technique should permit the design of smaller, more economical steam generators for coal and lignite combustion. The fluidized bed consists of particles of limestone fluidized in the coal during combustion. When the bed is heated with an ignition device to a temperature that will support combustion,

crushed coal introduced will ignite and the heat of combustion of the coal will raise the bed temperature still further. The temperature of the bed can be controlled by the regulation of excess air, the addition of heat transfer surface within the bed, the introduction of recycled flue gas or the addition of quantities of cool non-combustible solids. This would allow high sulfur coal to be burned within existing environmental regulations. Substantial reserves of low quality fuel will then become available at competitive costs, with additional savings from reduced pollution control equipment requirements and boiler costs. Several pilot projects are currently underway to develop fluidized bed combustion techniques. However, until development is completed and reliable electric power generation is demonstrated, this process cannot be considered as an alternative to conventional design fossil boilers.

ALTERNATIVE FGD SYSTEMS

Note: The following paragraphs discuss alternatives to the proposed FGD system described in Chapter 1 of the FEIS. The material originally presented in paragraphs 6.090 through 6.128 of the DEIS has been deleted from Chapter 6 and placed in Chapter 1 since an FGD system is no longer an alternative but instead is now part of the conceptual design of the facility.

Regenerable Systems

6.090
Presently there are eleven types of regenerable FGD systems in operation (U. S. and foreign) or in the bench scale and pilot plant status:

- Wellman-Lord
- Magnesium-Oxide
- Chiyoda
- Ammonia-Ammonium Bisulfate (ABS)
- Atomics International Aqueous Carbonate
- Bergbau Forschung/Foster Wheeler Dry Adsorption
- Catalytic/IFP Ammonia
- Catalytic Oxidation
- Citrate Buffered Absorption

- Shell/VOP Copper Oxide Absorption

- Westvaco Activated Carbon

Of these eleven, only three systems, the Wellman-Lord (operating on a 280 MW oil-fired plant in Japan, 115 MW coal-fired plant at Northern Indiana Public Service Co.), Magnesium Oxide (operating in a 150 MW coal-fired plant at Philadelphia Electric), and the Chiyoda (operating on a 350 MW oil-fired plant in Japan) have significant experience on a unit greater than 100 MW. The 100 MW represents the largest scaling up (100 MW to 850 MW) which could reasonably be expected in the design and operation of Cayuga Station at the Somerset Site. However, scale-up involves engineering risks and potential operating problems which would adversely affect plant reliability.

6.091
The Chiyoda process removes SO_2 via counter current scrubbing with weak sulfuric acid in a fixed bed absorber. The sulfuric acid contains a ferric ion catalyst which oxidizes the SO_2 to sulfuric acid. Limestone is generally used in this process to convert the week by-product sulfuric acid to solid gypsum as end-product for waste disposal.

Technology of the Chiyoda FGD process is reasonably uncomplicated. The basic disadvantages of the process and factors contributing to its rejection as an alternative BACT are as follows:

a. FGD system equipment requirements are larger to compensate for the limitations inherent in the reaction of SO_2 with weak sulfuric acid.

b. The potential for water pollution is high because of the acidic nature of the FGD process streams.

c. The process is designed to produce gypsum (calcium sulfate) which increases system equipment and operation requirements.

d. Gypsum has not been produced in conjunction with a coal-fired unit and the quality of the gypsum is uncertain.

e. The same reaction results in the creation of an extremely corrosive environment, which is reflected in the need for more costly, more corrosion resistant alloys.

f. Natural gypsum occurs in New York State.

6.092
The magnesium-oxide process uses a magnesium-oxide slurry to absorb SO_2 in a wet scrubber. The aqueous slurry of magnesium sulfite

formed in the scrubber is separated, dried, and calcined to regenerate magnesium-oxide and produce an SO_2 gas stream. The SO_2 recovered from the calciner is collected and directed to a chemical plant for conversion to sulfuric acid or elemental sulfur.

SO_2 removal efficiency and system component size benefit from the higher reactivity of magnesium. The process is more complicated than the throwaway systems. Demonstration systems have been troubled by mechanical and magnesium-oxide regeneration problems. Magnesium-oxide makeup requirements have, in general, been greater than anticipated in the system design.

The basic disadvantages of the process and factors contributing to its rejection as an alternative BACT are as follows:

a. The need for magnesium sulfate purge treatment and a sulfuric acid plant.

b. Dust losses from the rotary kilns used in the magnesium-oxide regeneration process.

c. The need of approximately 2,000,000 gal/yr of fuel oil for the calcination process.

d. The additional environmental impacts and potential problems of a sulfuric acid plant.

e. Sulfuric acid is costly to transport. Sulfuric acid cannot be stockpiled or readily stored in significant quantities and if not sold must be neutralized with limestone producing gypsum in approximately the same quantities as the sludge solids of the throwaway processes.

f. Existing installations have been beset by operating problems and poor availability.

g. Complete integrated system, including regeneration facilities has not been installed.

6.093
The Wellman-Lord process uses a sodium sulfite solution to absorb SO_2 forming sodium bisulfate, which is then regenerated by heat treatment to recover sodium and produce a concentrated stream of SO_2. The concentrated SO_2 can be converted to sulfur or sulfuric acid in a chemical plant.

SO_2 removal efficiency and system component size benefit from the high reactivity of sodium. Although the system chemistry is

reasonably uncomplicated, the system design is not. A purge treatment is required to control sodium sulfate buildup. Sodium sulfate is not regenerable and its production creates the need for significant sodium alkali makeup. As with essentially all regenerable systems, contamination and subsequent impurity buildup must be avoided. The process requires a high degree of particulate removal and flue gas cooling prior to the SO_2 absorption process. The concentration of the SO_2 stream liberated in the sodium alkali regeneration process is sufficiently high that the gas can be utilized as feed stock for either sulfuric acid or elemental sulfur production. Allied Chemical has designed an SO_2 reduction process in conjunction with the Wellman-Lord FGD process so that a completely integrated elemental sulfur process is offered. However it utilizes natural gas as the reductant. Natural gas is presently not available at the Somerset Site. Therefore, an onsite coal gasification plant to produce a reductant would have to be included as part of this process.

The basic disadvantages of the process and factors contributing to its rejection as an alternative BACT are as follows:

a. The need for a coal gasification plant.

b. The lack of experience using a manufactured gas as a reductant of elemental sulfur.

c. Complicated system design.

d. Production of a significant amount of sodium sulfate, which must be purged from the system. The marketability of sodium sulfate is questionable. If the product cannot be sold, additional treatment facilities will be required to prevent major water pollution problems.

e. Significant environmental problems associated with the coal gasification plant will have to be resolved.

f. The lack of operating experience for extended periods on flue gas from coal-fired boilers.

g. Substantively higher cost.

Throwaway Systems

6.094

Lime - The lime scrubbing process uses a recirculating slurry of calcium hydroxide to absorb SO_2 in a wet scrubber. The reaction end-product is calcium sulfite/sulfate which requires the same treatment as that produced in the limestone process.

6.095
High Magnesium Lime - The high magnesium lime scrubbing process is a variation of lime scrubbing which employs a lime slurry containing five-six percent magnesium. The magnesium in the slurry enhances the SO_2 removal efficiency and minimizes the scaling potential inherent in the lime process. The system produces an end-product of calcium sulfite/sulfate solids with magnesium in occluded water. The solid end-products require dewatering and stabilization prior to land disposal.

6.096
Double Alkali - The double alkali process is a wet scurubbing process which uses a soluble alkali (normally sodium-based) to absorb SO_2. The solution of sodium sulfite/sulfate formed in the scrubber is then reacted with lime or limestone to form solid calcium sulfite/sulfate and to regenerate the sodium-based alkali for recycle in the scrubber loop. The resultant calcium sulfite/sulfate requires further dewatering and stabilization prior to land disposal.

6.097
Sodium Carbonate Scrubbing - The sodium scrubbing process uses soda ash to absorb SO_2 in flue gas. The soda ash is used as a once-through reagent with the resultant solution of sodium sulfite/sulfate disposed of in lined ponds. This method of disposal depends on natural evaporation for solids concentration; therefore, the sodium carbonate process is limited to arid areas where this evaporation is possible.

The double alkali and sodium carbonate processes have not been used on installations greater than 500 MW. For this reason, these have been eliminated from further consideration. A limestone-based FGD system was selected over a lime-based system due to the more favorable economics, since experience, energy consumption and environmental impacts are very similar. Lime is produced from an energy-dependent manufacturing process while limestone is an extracted material. Therefore, limestone requires substantially less energy for production than lime. Although it is not reflected in the comparison, it is felt that limestone as a locally available, extracted material will escalate in price at a lower rate than lime and will provide more favorable long-term economics.

CHAPTER 7 - THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

INTRODUCTION

7.001
This chapter sets forth the relationship between the short-term use of man's environment implicit in the construction and operation of the proposed Cayuga Generating Station at Somerset and the inherent long-term impact of the proposal on future generations. During the relatively short 30- to 40-year life of the proposed facility, the present generation will derive benefits primarily in the form of electrical energy. The effect of meeting the demand for power is a maintenance and possibly expansion of the standard of living. The following paragraphs contain a discussion of postulated long-term impacts, beyond the expected life of the Cayuga Generating Station, with the realization that the present generation is trustee of the environment for future generations and that proper control of the short-term use of the site can minimize long-term effects. However, even with proper control of the site, there are trade-offs between derived short-term benefits and impacts on future generations.

LAND USE

7.002
The proposed Somerset Site comprises a total of 963 acres. Plant construction will necessitate the clearing of 171 acres or 17.8 percent of the site. Of the 171 acres, 65 acres will be occupied by the plant and facilities and the remaining 106 acres will be cleared for landscaping and construction-related facilities. The major area of the site is zoned agricultural, although a portion of the middle of the site is zoned industrial and the shoreline area is zoned residential. After the effective life of the plant, future land use will depend upon the power plant decommissioning plans. If the site is not reused as a power plant facility, only those areas which contained structures which could not be economically removed would be unavailable for reclamation.

AQUATIC ECOSYSTEM

7.003
The withdrawal of Lake Ontario waters for cooling purposes will entail entrainment and impingement of aquatic organisms. Through design and location of the intake structures these effects will be minimized and are expected to have insignificant impact on the long-term stability and productivity of Lake Ontario's aquatic biota. The discharge is also expected to have insignificant impact on the lake's

resources and assimilative capability. The estimated losses of organisims are considered to be short-term losses of individuals rather than long-term losses of species or populations. The submerged structures (intake and discharge) will alter a minimal amount of benthic habitat and no significant losses will occur.

TERRESTRIAL ECOSYSTEM

7.004
Impacts on the terrestrial ecosystem at the Somerset Site will occur due to construction operations and solid waste disposal. Construction activities will result in the interruption and alteration of vegetational succession, displacement of wildlife, and changes in the movement of fauna due to physical barriers. The proposed stabilized sludge and ash disposal areas will result in the creation of mounds 60 to 70 feet high. By applying proper reclamation techniques these mounds will have only a minimal impact on the area although they will be a permanent alteration of the landscape.

7.005
Long-term impacts associated with stabilized sludge ash disposal can occur from accumulation of trace elements in plants and soil. Proper reclamation procedures will minimize these effects.

7.006
Should the final coal source be obtained from expansion of existing strip mines or opening new strip mines, additional terrestrial habitat will be lost.

AIR QUALITY

7.007
Construction and operation of the proposed facility will result in some local, short-term degradation of air quality. Increases in ambient water vapor, carbon dioxide, sulfur oxides, nitrogen oxides, particulates, and trace elements will occur during plant operation. These emissions will be below allowable Federal and State standards. If combustion product emissions cease at the end of the life of the plant, no long-term impacts on air quality are foreseen.

WATER QUALITY

7.008
Construction and operation of the proposed facility are not expected to produce any long-term impacts on water quality. Short-term impacts caused by waste heat may occur. Contaminated water associated with runoff and/or leachate from the disposal site will be treated so as to be in compliance with appropriate Federal and State discharge standards.

AIR USE

7.009
The proposed construction will have minimal impact on air traffic within close proximity of the site. Some migrating birds will be killed by collision with the stack, although losses are expected to be minimal. The long-term impact of the facility on air use will depend on decommissioning plans. If the stack is removed, no restrictions on air space are anticipated. Atmospheric emissions are not expected to foreclose future options on area air use.

MINERAL USE

7.010
Over the anticipated 30- to 40-year lifetime of the plant, approximately 95 to 125 million tons of coal will be required as fuel and approximately 6.2 to 6.9 million tons of limestone will be required by the FGD system. Support operations such as mining and shipping will result in additional energy demands. The coal demand of the facility will constitute only a small percentage of the total U.S. reserves.

AESTHETICS

7.011
The long-term impact of the proposed plant on local aesthetics will depend on the actions taken during decommissioning. If all above-ground structures are removed, no major long-term aesthetic impact will result. The stabilized FGD sludge/ash disposal mounds, if properly graded and revegetated, will provide long-term relief in an area that was once flat.

CHAPTER 8 - IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

INTRODUCTION

8.001
This chapter identifies unavoidable environmental impacts of the proposed action which irreversibly limit future uses of the environment or result in the commitment of resources that are neither renewable nor recoverable. Thus, an irreversible commitment results in environmental changes which could not, at a future date, be altered to restore the environment to its pre-project state. For the purpose of this discussion the term "resource" is defined to include not only sources of labor and materials, but also natural and cultural resources. These resources may be lost or destroyed as a consequence of the construction, operation, and maintenance of the proposed Cayuga Generating Station at Somerset.

MATERIAL RESOURCES

8.002
The construction and operation of the proposed Cayuga Generating Station will involve both long- and short-term commitments of natural resources. Some of the material such as structural steel, aluminum, copper and tin may be reclaimed, if it is economically feasible, at the end of station operation. The amount of these materials utilized in construction of the proposed plant will comprise a very small fraction of U.S. and world production and should have an insignificant impact on the availability of these resources.

MINERALS

8.003
Operation of the station will result in the irretrievable loss of about three million tons of coal per year, approximately 220,000 tons of limestone per year, and 67,000 barrels per year of No. 2 distillate oil. Additional fuel will be consumed during the mining, construction, and transportation of materials and other associated facility support operations. These consumable resources will be irretrievably committed.

AGRICULTURAL PRODUCTIVITY

8.004
Most of the 963 acres of the Somerset site is zoned agricultural and 94 percent (910 acres) has been classified as prime farmland. Since this land will not be farmed, the agricultural potential of the site

will be irreversibly committed for the life of the plant, although some land may be available for lease as farmland. Land areas disturbed will result in the loss of prime farmland soils. Sixty-five acres will be occupied by the plant and facilities and this area may be permanently lost from agricultural productivity if renovation costs are prohibitive.

HUMAN RESOURCES

8.005
The construction, operation, and maintenance of the proposed facility at Somerset will require the irreversible and irretrievable commitment of human resources to design, build, and operate the plant as well as design, build, mine, and transport the necessary supplies and materials. Construction of the station will require approximately 6,400,000 manhours, including crafts and supervision. Assuming an operation and maintenance force of approximately 112 people, 40 hours per week, approximately 240,000 man-hours per year will be required for the 30 to 40 year life of the proposed facility.

OTHER RESOURCES

8.006
Natural and cultural resources committed to loss or destruction as a result of the construction, operation, and maintenance of the proposed facility are difficult to quantify as a percent of available resources. Archaeological sites not identified during predictive and intensive surveys or during construction monitoring could be lost. This represents a potential impact that could be irreversible.

8.007
Resources which might be considered irreversibly and irretrievably committed, such as terrestrial and aquatic habitat may, in fact, be reestablished after plant decommissioning depending on what future use is made of the site.

CHAPTER 9 - COORDINATION WITH OTHERS

INTERAGENCY COORDINATION

9.001
During the review of the New York State Electric & Gas Corporation (NYSE&G) permit application, it became apparent that a multi-disciplinary evaluation would be required to identify and define the environmental impacts associated with the construction and operation of the proposed power generating station. In order to initiate such an evaluation, it was necessary to meet with a number of agency representatives with specialized training and experience in the various impact disciplines and with a thorough working knowledge of Federal, State, and local regulatory guidelines applicable to the proposed generating station. These coordination meetings resulted in the establishment of technical review and consultation procedures and the identification of standards which must be met by the facility to insure that the most environmentally acceptable design is achieved.

9.002
An interagency technical review of the applicant's environmental reports was established, and during this period the agencies have evaluated the data collection effort by the applicant to insure that there is sufficient information to analyze the overall impact of the proposed facility on the environment; identified areas where additional information was required; suggested mitigative measures; and commented on project impacts and alternatives.

9.003
Overall, the coordination meetings and technical review have assisted in the development and analysis of the data contained in the draft Environmental Impact Statement (DEIS). Interagency coordination efforts will be continued up to the point a decision is made as to whether or not the Department of the Army permit should be issued.

9.004
The following Federal and State agencies either participated in the predraft coordination meetings and technical review or supplied supplemental information:

Heritage and Conservation Recreation Service
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
U.S. Department of the Interior
National Park Service
New York State Public Service Commission
New York State Department of Environmental Conservation

New York State Department of Transportation
Niagara County Department of Public Works

During preparation of the final EIS (FEIS) the U. S. Department of Agriculture Soil Conservation Service provided technical information and assistance in identifying prime and unique farmlands. The Corps has also had meetings with the U. S. Department of Interior National Register Office and the Advisory Council on Historic Preservation to insure that their concerns are adequately addressed in the FEIS. The Corps also had meetings with the U. S. Fish & Wildlife Service. See paragraph 9.014.

COORDINATION WITH THE GENERAL PUBLIC

9.005
In an effort to gain full public involvement in the review of the NYSE&G proposal, the Corps public notice announcing the proposed work was given wide distribution. The public notice advertised the actual work requiring Department of the Army permits, mentioned that this work was ancillary to the establishment of the proposed Cayuga Generating Station, advised that the Corps would prepare an Environmental Impact Statement on the entire generating facility, and requested comments on the proposal. Copies of the public notice were sent to Federal, State, regional and local officials, agencies, environmental groups, and private citizens. Additionally, news releases were transmitted to 40 newspapers and radio and television stations in the Buffalo Metropolitan area and the Somerset, NY vicinity. A formal public meeting was held on 20 June 1978 in Barker, NY to receive public input on the DEIS. The major concerns raised by the public and the appropriate paragraphs of the FEIS that reflect these concerns are as follows:

Impact of construction activity traffic on roads and bridges - 4.053a
Public access to shoreline - Response to Comment
Rail routes - 1.035
Shore protection - 1.045

COORDINATION WITH THE APPLICANT

9.006
Throughout the permit application processing period, the Corps of Engineers has met several times with representatives of the New York State Electric and Gas Corporation and their consultant, United Engineers and Constructors, Inc., Boston, MA, to discuss coordination procedures and to clarify various issues that were identified during both the Corps review and interagency review of the applicant's environmental report and baseline data as well as comments on the

DEIS. This coordination resulted in timely repsonses by the applicant to issues and concerns and has insured that the most recent developments and changes in project design have been incorporated in this Environmental Impact Statement.

COORDINATION INITIATED BY THE APPLICANT

9.007
New York State Electric & Gas Corporation has consulted with various local agencies, local institutions, and regional planning boards throughout the permit processing period to obtain relevant information and identify the concerns of these groups.

9.008
As part of the New York State Article VIII proceedings, the applicant has been involved in public hearings and meetings. During these hearings, the public was invited to comment on the proposed power project. Throughout the period of field data acquisition for the Article VIII application, NYSE&G has had ongoing dialogue with the staffs of the New York State Public Service Commission and New York State Department of Environmental Conservation. These discussions resulted in some modifications to the data collection programs, inclusion of additional topics of concern, and alternatives to the proposed power plant design. During the extensive public hearings for Article VIII, which were open to the public, the applicant answered questions and provided clarification and additional information on all facets of the baseline environmental studies, engineering design and associated environmental impacts. The applicant, the staff of the New York State Public Service Commission, and the staff of the New York State Department of Environmental Conservation have independently informed the Corps of all additional information generated during the Article VIII proceedings.

9.009
New York State Electric and Gas Corporation has also consulted directly with several Federal agencies. The applicant has coordinated with or contacted the Federal Energy Administration, Federal Aviation Administration, National Marine Fisheries Service (U.S. Department of Commerce), National Park Service (U.S. Department of the Interior), and the U.S. Environmental Protection Agency.

LAND USE PLANS

9.010
Federal, State, and local agencies responsible for land use planning were contacted to determine the relationship of the proposed action to land use plans or proposals. A letter requesting such information was sent to the following agencies: State of New York Office of

General Services, New York State Public Service Commission, Division of State, U.S. Department of Housing and Urban Development, Erie and Niagara Counties Regional Planning Board, Niagara County Economic and Development Planning Department, Newfane Town Planning Board, Barker Village Planning Board, and the Somerset Town Planning Board. Copies of these letters can be found in Appendix E. The concerns of the coordinating agencies are discussed in Chapter 3 of this environmental statement.

CULTURAL RESOURCES

9.011
Cultural resources reports were sent to the National Park Service and the New York State Office of Parks and Recreation for review and comment. The reports prepared for the New York State Electric and Gas Corporation by Peter P. Pratt, Ph.D., State University of New York at Oswego, and Marjorie K. Pratt, Ithaca College, contained information on the archeological surveys that were performed, the survey results, archeological and historical background of the region, and recommendations for future study and compliance with applicable statutes. The concerns of the coordinating agencies are discussed in Chapter 4 of this environmental statement. Members of Corps staff met with representatives of the Heritage and Conservation Service in Washington, DC to discuss the procedural steps for National Register of Historic Places eligibility determination. Certain resources have been identified as potentially eligible for inclusion in the National Register. The Corps submitted requests for determination of eligibility to the Keeper of the National Register on 22 September 1978. The potential eligibility of these resources is discussed in Chapter 2.

STATEMENT COORDINATION

9.012
To insure full coordination, the DEIS was sent to Federal, State, and local Government agencies, private industries, citizen and environmental groups, and individuals for review and comment. A coordination list is presented below:

- U. S. Environmental Protection Agency
- U. S. Department of Agriculture
- U. S. Department of Interior
- U. S. Department of Housing and Urban Development
- U. S. Department of Commerce
- U. S. Public Health Service
- Food and Drug Administration
- Water Resources Council
- Nuclear Regulatory Commission

- Federal Aviation Administration
- Federal Railroad Administration
- Great Lakes Basin Commission
- Appalachian Regional Commission
- U. S. Coast Guard
- General Services Administration
- U. S. Department of Health, Education, and Welfare
- Interstate Commerce Commission
- National Endowment for the Arts
- St. Lawrence Seaway Development Corporation
- Federal Highway Administration
- U. S. Fish and Wildlife Service
- Advisory Council for Historic Preservation
- U. S. Department of Energy

New York State:

- Public Service Commission
- Department of Environmental Conservation
- Office of General Services
- Office of State Archeologist
- Department of Health
- Division of Budget
- Office of Parks and Recreation
- Sea Grant Program Office
- Department of Commerce
- Division of State
- Department of Transportation
- NY Job Development Authority
- Department of Agriculture and Markets
- State Energy Office

County:

- Niagara County Board of Supervisors
- Erie and Niagara Counties Regional Planning Board
- Niagara County Economic and Development Planning Department

Local:

- Newfane Town Planning Board
- Barker Village Planning Board
- Somerset Town Planning Board

Industries, Citizen and Environmental Groups and Individuals:

- New York Power Pool Control Center
- Natural Resources Defense Council

- Sierra Club, New York Office
- NY Great Lakes Grape Industry Program
- League of Women Voters
- ORBA Corporation

9.013
Comments on the DEIS were received from those Federal, State, and local agencies as well as interested parties listed in Item 5 of the Summary which precedes the main body of this report. Copies of the letters of comment and Corps responses to the comments are contained in Appendix G of this report.

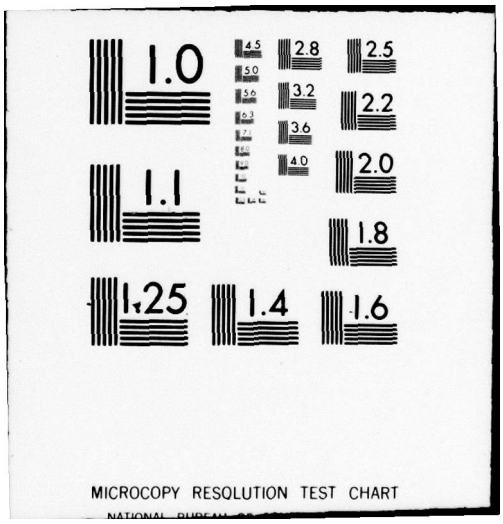
9.014
Included at the end of this section is correspondence between the Corps of Engineers, Regional Fish and Wildlife Service and the U. S. Department of Interior concerning Department of Interior's comments to the DEIS. Minutes of a meeting held to discuss the comments are also provided.

AD-A080 096 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 5/5
FINAL ENVIRONMENTAL IMPACT STATEMENT PERMIT APPLICATION BY NEW --ETC(U)
DEC 78 A K MARKS, P G LEUCHNER, R S ROTHMAN

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6 OF 8
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NCC-30-S

21 July 1978

Bruce Blanchard, Chief
Office of Environmental Projects Review
ATTN: Ms. Lillian Stone
Office of the Secretary
U.S. Department of the Interior
Room 4350
Main Interior Building
18th & C Street, NW
Washington, DC 20240

Dear Mr. Blanchard:

This letter concerns the comments of the U.S. Department of the Interior on our Draft Environmental Impact Statement for the proposed New York State Electric and Gas Corporation electric generating station at Somerset, New York. This letter of comment dated 6 July 1978 and designated ER 78/401 presents the concerns of the U.S. Fish and Wildlife Service and other Department agencies.

On 14 July 1978, my staff contacted Dr. Alfred Eipper of the U.S. Fish and Wildlife Service regional office in Boston by telephone to determine the origin of the subject comments. My staff was informed that comments pertaining to fish and wildlife resources were originally prepared by the Cortland Field Office.

Subsequently, a meeting was held on 18 July 1978 at the Buffalo District office with Ms. Lynn Lewis of the Cortland Field Office staff. The meeting was held to discuss our need for clarification of the issues contained in the 6 July 1978 letter of comment and to determine the specific information which the Fish and Wildlife Service believes is necessary to satisfy their concerns.

A vast amount of appropriate site specific and regional data on fish and wildlife resources has been developed and has been thoroughly analyzed by the Corps of Engineers, the U.S. Environmental Protection Agency, the New York State Public Service Commission, and the New York State Department of Environmental Conservation. The independent analyses of these regulatory agencies included a thorough assessment of all alternatives to the proposed project. In accordance with evaluations performed under Sections 316(a) and 316(b) of the Federal Water

NCBCO-S
Mr. Bruce Blanchard

Pollution Control Act Amendments of 1972, the Corps of Engineers and the regulatory agencies mentioned above have concluded that once-through cooling is acceptable for the proposed Somerset Cayuga Station. The findings of the U.S. EPA are enclosed. Additionally, the U.S. Fish and Wildlife Service participated in the initial meetings pertaining to 316(a) and (b) demonstrations for the proposed facility. I, therefore, believe that we have more than sufficient information to answer the concerns of the Fish and Wildlife Service. However, the letter of comment dated 6 July 1978 states on page one that the Draft EIS is inadequate, based on inappropriate and insufficient data, and does not adequately assess alternatives. The text of this letter does not indicate the specific information required to eliminate these inadequacies and it is, therefore, difficult to respond to the concerns. To include all the information which has been generated to date would be beyond the scope of an Environmental Impact Statement.

I have, therefore, transmitted a copy of the 18 July 1978 meeting minutes to the Cortland Field Office, U.S. Fish and Wildlife Service along with a request that they provide me with a written response indicating whether the information discussed at the meeting would satisfy their concerns. This procedure is being followed in accordance with your instructions of 20 July 1978. A copy of the cover letter and meeting minutes is enclosed for your information.

I consider this an urgent matter and would appreciate your cooperation in expeditiously resolving this situation.

Sincerely yours,

Glatzel
Leuchner
Hair
~~Counsel~~
DDE
DE

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incls
as stated

COPY FURNISHED:
1. Regional Administrator
   USEPA, Region II
2. Dr. Alfred Eipper
   USF&WS - Boston
3. Paul Hamilton
   USF&WS - Cortland
4. Lynn Lewis
   USF&WS - Cortland

CF: NCBCO-S

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S

21 July 1978

Mr. Paul Hamilton
Field Supervisor
U.S. Fish and Wildlife Service
100 Grange Place
Cortland, NY 13045

Dear Mr. Hamilton:

This letter concerns the comments of the U.S. Department of the Interior on our Draft Environmental Impact Statement for the proposed New York State Electric and Gas Corporation electric generating station at Somerset, New York. The letter of comment dated 6 July 1978 and designated ER 78/401 presents the concerns of the U.S. Fish and Wildlife Service and other Department agencies. A copy of this letter is provided as Inclosure One.

On 14 July 1978, my staff contacted Dr. Alfred Eipper of your regional office in Boston by telephone to determine the origin of the subject comments. My staff was informed that comments pertaining to fish and wildlife resources were prepared by your office. Subsequently, a meeting was held on 18 July 1978 at the Buffalo District office with Ms. Lynn Lewis of your staff. The meeting was held to discuss our need for clarification of the issues contained in the 6 July 1978 letter of comment and to determine the specific information which your staff believes is necessary to satisfy your concerns.

Inclosure Two is a copy of the minutes of the 18 July 1978 meeting with Lynn Lewis of your staff. The minutes discuss the information which can be included in the Final EIS to address your concerns. I am requesting that you provide me with a written response within 10 days indicating whether the incorporation in the Final EIS of the information discussed at the 18 July 1978 meeting will satisfy your concerns. I have furnished a copy of this letter along with the meeting minutes to the U.S. Department of the Interior in Washington, DC and to the Regional Administrator of the U.S. Environmental Protection Agency, Region II.

NCBCO-S
Mr. Paul Hamilton

I consider this an urgent matter and would appreciate your cooperation in expeditiously resolving this situation.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incl
as stated

COPY FURNISHED:
1. Mr. Bruce Blanchard
   U.S. Dept. of the
   Interior - Washington, DC
2. Dr. Alfred Eipper
   USF&WS - Boston
3. Regional Administrator
   U.S. EPA - Region II

INCLOSURE TWO

MEETING MINUTES

MEETING HELD TO DISCUSS DEPARTMENT OF INTERIOR COMMENTS ON SOMERSET EIS
18 JULY 1978

1. A meeting with a representative of the U.S. Fish and Wildlife Servce was held at the Buffalo District Office at 0900 hours on 18 July 1978 to clarify issues in the Department of Interior letter of comment ER 78/401 dated 6 July 1978 which provided comments on the Corps Draft Environmental Impact Statement for the proposed New York State Electric and Gas Corporation steam generating station at Somerset, New York. Present at the meeting were Lynn Lewis, Cortland Office, U.S. Fish and Wildlife Service; Arthur Marks and Tom Glatzel, Environmental Analysis Section, Buffalo District Corps of Engineers.

2. The purpose of the meeting was to clarify the ambiguities in the Department of Interior's comments and to reach an agreement concerning the manner in which the Corps can satisfactorily address the intent of those comments in the Final EIS.

3. The following paragraphs refer to those portions of the Department of Interior's letter which were discussed at the meeting and describe the agreement reached between the Fish and Wildlife Service and the Corps regarding the manner in which the issues can be addressed in the Final EIS:

General Comment - page 1, Dept. of Interior letter.

The comment, "We find the draft statement to be inadequate in its discussion of fish and wildlife resources at the Somerset site. The analysis of these resources comes from an inadequate or inappropriate data base. This is due to insufficient data collection or to the use of data gathered elsewhere in Lake Ontario and extrapolated to the Somerset Site" cannot be addressed as such. During the meeting Ms. Lewis said this comment referred to the fact that only one year's fishery data were presented. Since the applicant can provide us with another year's data, this comment can be addressed by providing these data in the Final EIS. Ms. Lewis also stated that the "inappropriate" data base referred to impingement estimates extrapolated from data collected at Nine Mile Point and Ginna. We indicated that draft Section 316(b) guidelines published by the U.S. Environmental Protection Agency (May 1, 1977) state on page 37, "Potential effects at proposed intake structures should make maximum use of existing data

at operating structures to extrapolate involvement and mortality estimates to a new intake." Ms. Lewis suggested that the Corps cite the New York State Department of Environmental Conservation studies at Cape Vincent, NY which imply that fish population distributions at Nine Mile Point and Ginna may be different from those at Somerset and that the applicant make every feasible effort to take this factor into consideration in calculating impingement estimates. However, we pointed out that unless a hydrodynamic model to predict impingement quantitatively based on onsite fish collection effort has been developed since 1 May 1977, we are not aware of the existence of any validated models (refer to page 47 of the draft guidelines of 316(b) demonstrations). We will attempt to provide correlation if possible. Finally, Ms. Lewis stated that the second paragraph under General referred to specific comments presented in subsequent paragraphs and was not to be taken as a comment itself.

Ash and Dredge Spoil Disposal, page 3, Dept. of Interior letter.

We stated that paragraphs one and two are no longer relevant because of the use of a flue gas desulfurization system. The marshy areas described in paragraph three do not exist on the site itself and. therefore, will not be affected. Ms. Lewis indidated that a statement to this effect will address the comment. Paragraph four indicates the need for environmental analysis of alternative disposal sites and the impact of dredge spoil disposal on these sites. We were told this comment was based on the assumption that off-site disposal areas were being considered. The applicant plans to dispose of all dredge spoils on site and in fact may be required to do so. This comment can be resolved by a statement to that effect, supplemented with data on the on-site disposal area.

Endangered Species, page 4, Dept. of Interior letter.

We stated that the comment, "However, no further field observations were made to determine if this was true, or if other bald eagles were in the area, or using the resources of the proposed Somerset plant site" and the comment, "The Final Statement should provide an in-depth study to ascertain if any threatened or endangered fauna are on or near the site...." are misleading and cannot be answered as such. This is due to the fact that the sighting of the single transient eagle was part of an in-depth study already conducted for over a year. According to the sampling methodology described in Article VIII, the primary effort of the sampling program was placed on determining the status of rare and endangered (as well as critical and valuable) species. The bald eagle was sighted on 5 April of the sampling year and was never seen

again during any field observations for the rest of the year. Its absence during subsequent field operations cannot justify the comment stating that those operations were not carried out. Ms. Lewis stated that a description of the extent and purpose of the sampling methodology as shown above would provide a satisfactory response.

Stack Gas Cleaning, page 5, Dept. of Interior letter.

We stated that regenerative scrubbers are discussed in paragraph 6.091 of the Draft EIS and that the source of additional information could be cited.

Alternatives, page 5, Dept. of Interior letter.

We stated that Section 316(a) of the Federal Water Pollution Control Act Amendments of 1972 provides for a waiver of guideline limitations if it can be shown that the limitations for the control of the thermal component of the discharge are more stringent than necessary to assure the protection and propagation of a balanced indigenous population in and on the receiving water body. The U.S. EPA and appropriate state regulatory agencies (NYS Department of Environmental Conservation and NYS Public Service Commission) after evaluation of the applicant's 316(a) demonstration have concurred in their opinions that the once-through cooling system at Somerset is acceptable and that cooling towers appear to be an excessive mitigation. Although the Federal law mandates use of cooling towers, the mandate is not premised on a demonstration by the applicant that once-through cooling is the only acceptable alternative; rather it allows for waiver of thermal effluent guidelines as discussed above. Throughout the overall evaluation of the project, cooling towers have been addressed in detail and this detailed information was summarized in the alternative section of our Draft EIS. To include all the information generated to date would be well beyond the scope of an Environmental Impact Statement. Ms. Lewis suggested that information on possible avian mortality and other disadvantages of cooling towers at this particular site as well as the applicant's rationale for choosing once-through cooling and the reasons for the EPA's acceptance of the 316(a) waiver will suffice.

Fish and Wildlife Coordination, page 6, Dept. of Interior letter.

Ms. Lewis told us this paragraph was a summary and the statement, "The draft EIS does adequately describe..." is not to be taken as a comment to be addressed.

In summary, we explained that letters of comment received in response to Corps of Engineers Environmental Impact Statements are published in the Final EIS in accordance with CEQ guidelines and Department of the Army regulations. A specific response and possible modification of sections of the text are provided for each pertinent comment. General statements such as "alternative cooling systems have not been adequately evaluated" or "the data base is inappropriate and inadequate" cannot be adequately addressed with the exception of providing a general answer such as "we believe that the intensive on-site study of fish and wildlife resources is both appropriate and adequate." Corps staff does not believe that a general response to a general comment would be in the best public interest. Through mutual cooperation all specific comments could be addressed.

The meeting was adjourned at 1330 hours.

Thomas E Glatzel

THOMAS GLATZEL, Biologist
Environmental Analysis Section
Regulatory Functions Branch

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
100 Grange Place
Room 202
Cortland, New York 13045

August 2, 1978

District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Sir:

This is in response to your letter of 21 July 1978 concerning the comments of the U.S. Department of the Interior on the Draft Environmental Impact Statement (DEIS) for the proposed New York State Electric and Gas Corporation electric generating station at Somerset, New York.

We have reviewed the minutes of the 18 July 1978 meeting between representatives of the U.S. Fish and Wildlife Service and the Buffalo District, Army Corps of Engineers and for the most part agree with their content.

Our original comments which were submitted to the Department of the Interior were organized to include general comments, specific comments which expanded upon the general comments, and a summary statement. In some cases our general comments remained in the official Interior comments, while the specific comments to which they referred did not. This may have resulted in the need for the clarification of some comments submitted by the Fish and Wildlife Service.

We originally felt that data collected at the Somerset site for only one year represented an inadequate data base. This is purely a biological judgment on our part, due primarily to the magnitude of the project. However, we can present no firm reason as to why the year in which data was collected for the Somerset project may not be normal; we know of no unusual biological or meterological occurrences, hence this specific comment was deleted in the final Interior comments. Addition of any further data, however, would add to the quality of the Environmental Impact Statement (FEIS), but since one year of fisheries data is all that exist, its addition will suffice unless the applicant is willing to conduct further aquatic and terrestrial studies.

As explained in the minutes, inappropriate data came from extrapolation of impingement data from another portion of Lake Ontario to the Somerset site. There is no reason to assume that fish populations within the Lake are homogeneous. As indicated in the minutes, work is currently being done by the New York State Department of Environmental Conservation at the Cape Vincent Station which supports this position. This information has been put into the written record as testimony at the Sterling Power Plant hearing.

We have no additional comments on ash and dredge spoil disposal, other than to point out that if marshy areas do not exist in the proposed site then they should not have been mentioned in the general site description.

In regards to endangered species, there was no indication in the DEIS that an in-depth study had been carried out or that the sampling program had been specifically designed to determine the status of rare and endangered species. We cannot second guess the DEIS authors and assume that adequate investigations were carried out. Clarification, as indicated in the minutes, is needed.

Regarding alternatives to once through cooling systems, sufficient detailed information should be included in the DEIS to allow the reader to evaluate the case for once through cooling versus cooling towers or other alternative cooling methods. As indicated in the minutes, the decision-making process by which once through cooling was selected over cooling towers should be presented.

It is our hope that through our meeting and these additional written comments that our position has been sufficiently clarified.

Sincerely yours,

Paul P. Hamilton

Paul P. Hamilton
Field Supervisor

APPENDIX A: CONCEPTUAL DESIGN DATA

Table A-1 - Summary of Boiler and Stack Conceptual Design Data

		Conceptual Design Point Load[a]	Turbine Nameplate Load[b] 100%	75%	50%
1.	Superheater Flow - pph	6.125×10^6	5.538×10^6	4.158×10^6	2.762×10^6
2.	Superheater Outlet Pressure - psig	2618	2483	2447	2421
3.	Superheater Outlet Temperature - ^oF	1005	1005	1005	1005
4.	Re-heater Outlet Temperature - ^oF	1005	1005	1005	997
5.	Heat Input - mega Btu/hr.	7953	7292	5700	3899
6.	Flue Gas Flow - pph	9.33×10^6	8.90×10^6	7.46×10^6	5.76×10^6
7.	Stack Temperature - ^oF	122	122	122	122
8.	Stack Exit Velocity - ft./sec.	89	85	71	54
9.	Emissions from Stack[c]				
	a) NO_x (expressed as NO_2) - lbs./mega Btu	0.7	0.7	0.7	0.7
	b) SO_2 - lbs./mega Btu	1.2	1.2	1.2	1.2
	c) Particulates:				
	1) by fuel - lbs/mega Btu	0.1	0.1	0.1	0.1
	2) by any additives - lbs./mega Btu	-	-	-	-
10.	Stack Base Elevation 281 ft.				
11.	Stack Height Above Base 450 ft.				
12.	Stack Exit Diameter 25 ft ID				
13.	Boiler Efficiency 90.03%				

Table A-1 - Summary of Boiler and
Stack Conceptual Design Data (Cont'd)

(a) Based on predicted maximum net continuous capability of facility as defined in the Northeast Power Coordinating Council's Uniform Method for Rating Generating Capability. This is at 5 percent overpressure, valves wide-open, expected throttle steam flow.

(b) 100 percent corresponds to turbine manufacturer's guaranteed output and throttle flow at rated steam conditions.

(c) These are not design limits, but reflect Federal and New York State standards which will be achieved (or bettered) by use of low sulfur coal, precipitators, boiler design and operating procedures.

Notes: Item (1) Boiler is specified to be capable of operating at 6,500,000 pph superheater steam flow on a continuous basis.

Item (9) Values represent total particulates. Determination of contribution from additives cannot be made at this time.

Table A-2 - Summary of Turbine-Generator Conceptual Design Data
(Conceptual Design Parameters)

	Conceptual Design Point[b]	Name Plate[a]
Rating - MW (gross)	924.721	849.224
H_2 Pressure - psig	75	75
Heat Rate - Btu/kWh (gross)	7,729	7,730
Throttle Steam Flow - pph	6,125,000	5,538,478
Throttle Pressure - psig	2,520	2,400
Throttle Temperature - ^{o}F	1,000	1,000
Reheat Temperature - ^{o}F	1,000	1,000
Exhaust Pressure - in. Hg	1.5	1.5
Net Unit Output - MW (at high side bus of main transformer)	874[c]	803
Boiler Feed Pump Drive Type		
(Check One): Motor ___; Shaft ___; Auxiliary Turbine X .		

(a) At turbine manufacturer's guaranteed output and throttle steam flow at rated steam conditions.

(b) As defined on Table A-1.

(c) Net unit output is conventionally taken at the low side of the main transformer. This conceptual design point - maximum expected continuous output at transformer low side is 924,721 kW machine output less 46,000 kW estimated station service, resulting in 878,721 kW. This value is the basis of cost summaries in Subpart 72.4.

Table A-3 - Summary of Boiler and Stack Conceptual Design Data For Auxiliary Steam Boiler[a]

		Load		
		100%	75%	50%
1.	Superheater Flow - pph x 10^3	150	112.5	75.0
2.	Superheater Outlet Pressure - psig	150	150	150
3.	Superheater Outlet Temperature - ^oF	475	475	475
4.	Reheater Outlet Temperature - ^oF	None	-	-
5.	Heat Input - mega Btu/hr.	192.5	144.4	96.3
6.	Flue Gas Flow - pph	177,200	132,400	88,600
7.	Stack Temperature - ^oF	618	600	550
8.	Stack Exit Velocity - ft./sec.	75	55	35
9.	Emissions from Stack:			
	a) NO_x (expressed as NO_2) - lbs./mega Btu	0.25	0.25	0.25
	b) SO_2 - lbs./mega Btu	.10	.10	.10
	c) Particulates:			
	1) by fuel - lbs./mega Btu	negligible	negligible	negligible
	2) by any additives - lbs./mega Btu	-	-	-
10.	Stack Base Elevation 302 ft.			
11.	Stack Height Above Base 259 ft.			
12.	Stack Exit Diameter 4.75 ft. I.D.[b]			
13.	Boiler Efficiency 78.5%			

(a) Data given for each Package Boiler. Two auxiliary boilers will be installed.

(b) One stack for each auxiliary boiler.

Table A-4 - Summary of Condenser Conceptual Design Data
(Conceptual Design Parameters)

	Conceptual Design Point Load*	Percent of Plant Operating Capacity*		
		100% (Design)	75% (Est'd.)	50% (Est'd.)
1. Heat Load - mega Btu/hr	3.94×10^3	3.62×10^3	2.84×10^3	2.015×10^3
2. Back Pressure - in Hg	1.57	1.40	1.05	0.77
3. Inlet Water Temperature - ^{o}F	48.0	-	-	-
4. Temperature Rise - ^{o}F	35.0	32.2	25.2	17.9
5. Circulating Water Flow-gpm	224,918	-	-	-
6. Tube Velocity - ft./sec.	6.0	-	-	-
7. Tube Length - ft.	77	-	-	-
8. Number of Passes	1	-	-	-
9. Heat Transfer Surface - ft^2	416,800	-	-	-

*At same load conditions as in Table A-1

Notes: Item (1) 100% (Design) corresponds to manufacturer's rating point.
Item (7) Tube material is 90/10 copper/nickel.

APPENDIX B: DESCRIPTION OF ATMOSPHERIC DIFFUSION MODELS, ESTIMATED GROUND LEVEL CONCENTRATIONS FOR FACILITY ALONE, AND 1970 EMISSION INVENTORY FOR NIAGARA, ERIE, ORLEANS, AND GENESEE COUNTIES

MATHEMATICAL DIFFUSION MODELS

B.001
The stack of the proposed facility will be a source of sulfur dioxide (SO_2), nitrogen oxides (NO_x), suspended particulates (TSP), carbon monoxide (CO), hydrocarbons (HC), and various trace elements. Since the PSAQD only applies to ground level concentrations of SO_2 and TSP, only these pollutants will be addressed in this section. The pollutants NO_x, CO, and HC are addressed in Chapter 4, "Impact of the Proposed Facility on Air Quality."

B.002
The contaminants will be emitted from a 450-foot (137 meter) stack in a warm buoyant plume that rises far above the stack top before it loses its buoyancy and begins quasi-horizontal travel. By the time the rising phase is completed, atmospheric eddies begin to disperse the concentrated plume and the contaminants in the plume are diffused outward away from the plume centerline. Eventually some of the contaminants reach the ground. The resultant ground level concentrations are dependent on meteorological conditions, topography, and stack operating parameters. Mathematical diffusion models which account for these factors have been utilized to estimate the magnitude of these ground level concentrations as a fuction of distance and direction fron the stack.

B.003
Three such mathematical models have been utilized to perform calculations of ground level contaminant concentrations. A Gaussian diffusion model, applicable to almost all meteorological conditions, was used to estimate concentrations for each hour of the data base year 1 August 1974 to 31 July 1975. Input to this model consisted of site-specific meteorological data (described in Chapter 2, "Meteorology"), which included hourly wind speed, wind direction, and stability class as determined from the standard deviation of the wind direction, σ_θ , as measured at the applicant's onsite meteorological tower. The input also included hourly mixing depths as time interpolated from Buffalo radiosonde temperature profiles. Other input to the model included topography profiles as a function of distance and direction from the site, and stack operating parameters. In addition to hourly average concentrations, three-hour, 24-hour, and annual average concentrations were calculated as a function of distance and direction from the stack with this model. For the inversion breakup

fumigation condition and the lake breeze fumigation condition, two other Gaussian diffusion models were used to calculate maximum short-term SO_2 concentrations that would be associated with each of these situations.

B.004
The most important features of the hour-by-hour Gaussian model are presented in Table B-1.

B.005
The models are largely based on Gaussian diffusion assumptions following the methodology summarized by Turner (1970). The formulae presented by Turner are widely accepted in the field of diffusion modeling. The estimation of ground level concentrations involves calculations of plume rise, with the well-known Briggs formulae, the horizontal and vertical spread of the plume, and the influence of topography.

B.006
Calculations of plant impact are made along the centerline of each of 16 sectors corresponding to the cardinal compass points. Computations are made at 0.5 km intervals at distances 10 km or less from the plant, at 1 km intervals from 10 to 20 km from the plant, at 2 km intervals from 20 to 30 km from the plant, and at distances of 35, 40, 50 and 60 km. Hourly values of the SO_2 concentration are calculated at each of the 624 calculation points. Three-hour average values of SO_2 and 24-hour average values of SO_2 and TSP are computed at each point for each consecutive overlapping and 24-hour period. Annual average concentrations of SO_2, NO_2, and TSP are also calculated for each point.

B.007
A second Gaussian model is used to estimate a maximum short-term concentration SO_2 which might occur during a situation frequently referred to as the inversion breakup fumigation. In this situation, stack effluents which have been emitted during the night into a stably stratified atmosphere and have been effectively restricted from reaching ground level are rapidly transported downward to ground level during a short period in early morning. This downward mixing of the plume occurs when an unstable layer created by solar heating reaches a sufficient height to encompass the relatively concentrated nocturnal plume. The analysis of this inversion breakup condition follows the methodology recommended by Turner. Table B-2 summarzies the model equations and assume values for the various parameters for a "worst case" (maximum effect) inversion breakup situation at the Somerset Site.

TABLE B-1 (Page 1 of 3)

SUMMARY OF HOUR-BY-HOUR GAUSSIAN DISPERSION MODEL

1. Plume rise

a) Neutral, unstable:

$$\Delta h = 1.6F^{1/3} \times 2/3\ u^{-1}$$

where:

Δh = plume rise (m)

F = Buoyancy flux (m^3/sec), approximated by $3.7 \times 10^{-5}\ Q_H$

Q_H = sensible heat emission of plume, cal/sec

x = downwind distance (m)

x_{max} = downwind distance corresponding to final rise; approximated by $119\ F^{0.4}$ (m)

u = wind speed at top of stack (m/sec)

b) Stable:

$$\Delta h = 2.6\ (F/us)^{1/3}$$

where:

s = $(g/T)(\delta\Theta/\delta z)$, the restoring acceleration per unit vertical displacement for adiabatic motion in the atmosphere (sec^{-2})

g = gravitational acceleration (m/sec^2)

Θ = potential temperature of the atmosphere (^oK)

T = atmospheric temperature (^oK)

z = height above the ground (m)

11. Ground Level Concentrations

a) Unrestricted upward dispersion:

$$X(x,y,0) = Q(\pi u \sigma_y \sigma_z)^{-1} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] \exp\left[-\frac{1}{2}\left(\frac{H - \Delta h_t}{\sigma_z}\right)^2\right]$$

where:

$X(x,y,0)$ = 10 minute average concentration of pollutant (ug/m^3) at distance x downwind from source, distance y normal to the plume centerline and distance z = 0 at ground level

Q = emission rate of pollutant (ug/sec)

σ_y = standard deviation of plume distribution in crosswind direction (m)

σ_z = standard deviation of plume distribution in vertical direction (m)

u = wind speed at stack height (m/sec)

H = effective stack height; sum of physical stack height and final plume rise Δh (m)

Δh_t = one half of difference between stack base elevation and receptor elevation (positive only, maximum value is H/2 (m)

b) Restricted upward dispersion equation:

$$X(x,y,0) = Q\,(\pi u \sigma_y \sigma_z)^{-1} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] \left\{ \exp\left[-\frac{1}{2}\left(\frac{H - \Delta h_t}{\sigma_z}\right)^2\right] \right.$$

$$+ \tfrac{1}{2} \sum_{n=1}^{n=j} \left\{ \exp\left[-\frac{1}{2}\left(\frac{-H + \Delta h_t - 2nL}{\sigma_z}\right)^2\right] + \exp\left[-\frac{1}{2}\left(\frac{H - \Delta h_t - 2nL}{\sigma_z}\right)^2\right] \right.$$

$$\left. \left. + \exp\left[-\frac{1}{2}\left(\frac{-H + \Delta h_t + 2nL}{\sigma_z}\right)^2\right] + \exp\left[-\frac{1}{2}\left(\frac{H - \Delta h_t + 2nL}{\sigma_z}\right)^2\right] \right\} \right\}$$

where:

All terms are the same as defined for the unrestricted equation, and

l = inversion lid height (m)

The methodology for the calculation of the summation in the restricted dispersion equation and the procedure for determining what portion of the plume is trapped below the lid, along with all other specifics involved in the dispersion methodology are described in Appendix 73.4-1-C of the Article VIII Application.

III. Time Averaging Techniques

a) Receptor-specific one hour average centerline concentration:

$$X_{1\text{-hr}} = 0.7\ X_{10\text{-min}} \quad \text{where:} \quad 0.7 = (10/60)^{0.2}$$

b) Receptor-specific one hour sector average concentration:

$$X_{1\text{-hr sector average}} = X_{1\text{-hr}}\ (6.383\ \sigma_y/x)$$

where:

x is the downwind distance to the receptor point. (m)

The centerline formula is utilized for 1-hr and 3-hr average concentrations. The sector average formula is used for 24-hr and annual average concentrations. For hours when the plume is not in the sector where the receptor is located, the facility contribution to the receptor for those hours is zero.

TABLE B-2 (Page 1 of 3)

SUMMARY OF INVERSION BREAKUP
FUMIGATION MODEL

Equations

$$X_F = Q/\left(\sqrt{2\pi}\, u \sigma_{yF}\, h_i\right) \quad (1)$$

$$h_i = h_s + h + 2\sigma_z \quad (2)$$

$$\sigma_{yF} = \sigma_y + (h_s + \Delta h)/8 \quad (3)$$

$$x = u_{oc} t_m \quad (4)$$

$$t_m = (\rho_a c_p / R)\left(\partial\theta / \partial z\right)(h_i^2 - h_s^2)/2 \quad (5)$$

$$t_d = (\rho_a c_p / R)\left(\partial\theta / \partial z\right)(h_s + \Delta h - 2\sigma_z)^2 - (h_s + \Delta h - 2\sigma_z)^2)/4 \quad (6)$$

Explanation of Symbols

X_F - ground level concentration of contaminant (ug/m^3)

Q - Emission rate of contaminant (ug/sec)

u - wind speed at stack top (m/sec)

σ_{yF} - standard deviation of plume concentration distribution in the crosswind direction for the fumigation condition (m)

h_i - minimum height of plume top at time of inversion breakup (m)

h_s - stack height (m)

Δh - plume rise for stable conditions (m)

σ_z - standard deviation of plume concentration distribution in the vertical direction, assuming a virtual origin for "E" stability (m)

σ_y - standard deviation of plume concentration distribution in the crosswind direction, assuming a virtual origin for "E" stability (m)

x - nearest downwind distance at which fumigation can occur (m)

TABLE B-2 (Page 2 of 3)

u_{oc} - mean wind in the stable layer at height of final plume rise (m/sec)

t_m - time required for inversion to rise from h_s to h_1 (sec)

t_d - time that fumigation concentration X_F persists (assumed equal to one-half the time required for the inversion to rise from the bottom of the plume to the top of the plume)

ρ_a - density of air (g/m^3)

c_p - specific heat of air (cal/g/°C)

R - net rate of sensible heating of an air column by solar radiation ($cal/m^2/sec$)

$\partial\theta/\partial z$ - potential temperature lapse rate (°C/m)

Assumed parameter values

Q - 1203. gm/sec SO_2

u - 3 m/sec

h_s - 137 m

u_{oc} - 4 m/sec

a - 1.2×10^3 gm/m^3

R - 67 $cal/m^2/sec$

$\partial\theta/\partial z$ - 2° C/100m

Calculated parameters

h - 140 m

σ_z - 45 m

h_1 - 366 m

t_m - 4950 s

x - 19.9 km

TABLE B-2 (Page 3 of 3)

σ_{yF} - 800 m
X_F - 409 ug/m^3 (persists for a period t_d = 2100 sec or 35 minutes)

Notes: The values for σ_y and σ_{yF} are those given by Turner for flat terrain and do not include the effects of plume meander. The value of σ_z was conservatively assumed to remain constant at the initial value determined for the virtual origin of 45 m.

B.008
A third Gaussian model is utilized to estimate maximum short-term ground level SO_2 concentrations which might occur during a lake breeze fumigation situation at the Somerset Site. The lake breeze fumigation condition associated with maximum ground level concentrations of a contaminant emitted from a leeside stack is a situation where the plume is emitted into a stable layer (thereby depressing plume rise), the wind at plume level is onshore (and diffuses slowly in the stable layer), and downwind of the lakeshore the slowly diffusing plume is mixed to the ground in an unstable layer. This unstable layer grows in depth with distance from the shoreline and is commonly referred to as the thermal internal boundary layer (TIBL).

B.009
Conceptually, the above situation is similar to the fumigation condition associated with the inversion breakup condition. Significant differences between the two situations are: (a) the duration of the fumigation condition (lake breeze condition can last for a few hours), (b) onshore wind speeds are higher with lake breeze than those which can occur with inversion breakup, and (c) the surface-based unstable layer can grow more rapidly in depth with time in the lake breeze situation. Differences (a) and (c) contribute to a more deleterious effect from the lake breeze effect. At the Somerset Site, a particular set of meteorological conditions are necessary to produce a maximum ground level concentration in the lake breeze fumigation situation. Briefly, the required conditions are: (a) a low elevated inversion from stack top to plume rise with a wind direction parallel to the direction of a low level onshore (northerly) lake breeze, (b) the surface-based flow across Lake Ontario is warmer than, or at least not colder than, the lake water temperature, and (c) clear skies and a maximum intensity of incoming solar radiation. The Gaussian model developed for the lake breeze fumigation situation accounts for each of these factors in the analysis of a postulated "worst case" (maximum effect) condition. The model equations and assumed values for the various parameters are given in Table B-3 for both a worst case and an observed situation.

B.009a.
The selection of the range of wind speeds considered for potential lake breeze fumigation conditions for the proposed facility has been based on examination of relevant meteorological data for the period April-July 1974. The detailed results of these studies are described in Appendices 73.4-3-S, 73.4-4-S, and 73.4-5-S of the applicant's Article VIII application. These studies are mentioned in paragraphs 2.134 and 2.135 of the EIS. Six potential conditions of lake breeze fumigation for the proposed facility at the Somerset Site were identified during the April-July 1974 period, and these six cases are

TABLE B-3 (Page 1 of 2)

SUMMARY OF LAKE BREEZE
FUMIGATION MODEL

Equations

$$X_F = Q/\left(\sqrt{2\pi}\,\bar{u}\,\sigma_{yF}L\right) \quad (1)$$

$$\sigma_{yF} = \sigma_y + (h_s + \Delta h)/8 \quad (2)$$

$$L = h_s + \Delta h + 2\sigma_z = \left[2xR/(\rho_a c_p \uparrow \partial\theta/\partial z)\right]^{1/2} \quad (3)$$

$$x = \bar{u}t \quad (4)$$

$$t = (\rho_a c_p/R)(\partial\theta/\partial z)(L^2/2) \quad (5)$$

$$X_{3\text{-hr}} = X_F\,(10\text{ min}/180\text{ min})^{0.2} \quad (6)$$

Explanation of Symbols

All symbols have the same meaning as in Table B-2 except for the following:

$\bar{u}$ - mean wind speed in the TIBL

L - height of the top of the TIBL

x - distance inland from shoreline

t - time for the air to flow from x=0 to x

Assumed parameter values for a hypothetical "worst case"

Q - 1203. gm/sec SO_2

$\bar{u}$ - 4 m/sec

h_s - 137 m

ρ_a - 1.2×10^3 gm/m^3

R - 240 cal/m^2/sec

$\partial\theta/\partial z$ - 0.7°C/100 m

TABLE B-3 (Page 2 of 2)

Calculated Parameters

h - 181 m	x - 6.7 km
σ_{yF} - 337 m (based on E stability)	L - 484 m
σ_z - 83 m (based on E stability)	X_F - 734 ug/m^3 SO_2
	$X_{3\text{-hr}}$ - 412 ug/m^3 SO_2

summarized in Table 73.4-3-2-S of Appendix 73.4-3-S of the Article VIII application. The minimum wind speed in any of these cases was found to be four meters/second.

In order to review the use of a minimum wind speed of four meters/second in conjunction with the lake breeze fumigation model described in Appendix 73.4-3-S, two additional months of Somerset onsite meteorological data have been examined. These two months are 1-13 May, and 15 June 1976 to 15 July 1976. These two months have been selected since onsite balloonsonde data were obtained for these periods and these months are during the mid-spring to mid-summer period when potential lake breeze fumigation episodes can occur. The onsite meteorological tower data and onsite upper air data were examined with substantially the same procedures described in Appendices 73.4-3-S and 73.4-5-S. Potential lake breeze fumigation episodes for the proposed facility were identified by first examining the onsite main meteorological tower and lake tower data for three or more consecutive hours of onshore flow from 1000 EST - 1500 EST. Then, the relevant onsite balloonsonde data for the nominal 1300 EST sounding were examined, along with available weather observations obtained from the site logs and/or three-hour observations from the Buffalo and Rochester Airports. Onshore flow episodes were eliminated as potential lake breeze fumigation episodes if the balloonsonde 300 m (AGL) winds did not also indicate onshore flow, if the 300 m winds were greater than eight meters/second, if the sonde temperature profile did not indicate a stable lapse rate in the plume rise layer (150-300 m AGL), or if the available weather data indicated overcast conditions.

From the two months of data examined (5/1 - 5/31/76 and 6/15 - 7/15/76) four potential episodes of lake breeze fumigation conditions were found. The wind speeds and directions for these four potential episodes are summarized in Table B-3a. Two of the potential episodes do show mean plume wind speeds during potential lake breeze fumigation conditions less than four meters/second. However, it is noted that during these potential episodes with lighter winds, the large variability in wind direction both with time and/or with altitude is not compatible with the worst-case Gaussion lake breeze fumigation model as described in Appendix 73.4-3-S. This observed directional variability is illustrated in Table B-3a for both the 5/26 potential episode (mean plume speed of 2.4 m/sec) and the 7/15 potential episode (mean plume speed of 3.1 m/sec). For the 5/26 potential episode, the range of 15-minute mean wind directions from the 60 m tower is 54 degrees between 1030 and 1530 EST, and the range of observed directional sheer during the 1300 EST sonde flight (from the surface up to 329 m) is 109 degrees. For the 7/15 potential episode, the corresponding tower data range is 31 degrees, and the range of vertical shear is 55 degrees. This observed directional shear is consistent with the well established meteorological correlation between

TABLE B-3a

WIND SPEEDS AND DIRECTIONS FOR
FOUR POTENTIAL LAKE BREEZE FUMIGATION EPISODES
SOMERSET SITE - 5/76 and 6/15 - 7/15/76

	(a)	(b)	
	Wind Speed	Wind Direction (deg)	
		60m tower	Sonde (1300 EST)
5/26/76	60m tower - 2.8 m/sec	1030 EST - 352	0m - 35
	300m sonde - 2.1 m/sec	1130 EST - 20	67m - 12
		1230 EST - 34	134m - 54
	mean plume speed - 2.4m/sec	1330 EST - 14	201m - 67
		1430 EST - 340	267m - 79
		1530 EST - 343	329m - 330
		range - 54	range - 109
6/18/76	60m tower - 4.8m/sec	1030 EST - 67	0m - 60
	300m sonde - 3.1m/sec	1130 EST - 54	67m - 75
		1230 EST - 63	135m - 48
	mean plume speed - 3.9m/sec	1330 EST - 73	202m - 59
		1420 EST - 67	269m - 30
		1530 EST - 72	343m - 103
		range - 19	range - 73
6/27/76	60m tower - 3.5m/sec	1030 EST - 287	0m - 345
	300m sonde - 4.6m/sec	1130 EST - 300	68m - 347
		1230 EST - 324	137m - 296
	mean plume speed - 4.0m/sec	1330 EST - 326	205m - 285
		1430 EST - 325	274m - 283
		1530 EST - 322	338m - 273
		range - 39	range - 72
7/15/76	60m tower - 4.2m/sec	1030 EST - 57	0m - 40
	300m sonde - 2.1m/sec	1130 EST - 60	67m - 49
		1230 EST - 52	135m - 16
	mean plume speed - 3.1m/sec	1330 EST - 44	202m - 40
		1430 EST - 35	269m - 4
		1530 EST - 29	333m - 354
		range - 31	range - 55

TABLE B-3a (Cont'd)

NOTES

(a) The 60m tower wind speed is the 1100-1400 EST average speed. The 300m sonde wind speed is interpolated between the nearest data points. The mean plume speed is taken to be the mean of the 60m speed and the 300m sonde speed.

(b) The 60m tower directions are 15-minute average directions centered on the half-hour. The sonde directions are actual data points obtained during tracking.

higher wind speeds and steady direction, and lighter wind speeds and more variable direction. This wind direction variability and shear serves as a significant additional dilution mechanism for the stack emissions. The onsite data show significant shears even with speeds about four meters/second, so an assumption of a minimum speed of four meters/second in the modeling equation is conservative. The conclusion of the examination of the additional two months on onsite meteorological data is that a minimum wind speed of four meters/second with the Gaussian lake breeze fumigation model is supported.

The New York State Department of Environmental Conservation has questioned some of the assumptions made by the applicant in the calculation of Lake Breeze fumigation. NYSDEC believes that a net rate of sensible heating of an air column by solar radiation (designated as "R") should be 110 rather than 140. Additionally, maximum concentration may occur when only part of the plume is fumigated and the lapse rate assumed for stable onshore flow ($\partial\theta/\partial z$ should be 0.02° c/m rather than 0.007° c/m.

To address these points, a calculation has been made for "half plume" fumigation conditions using the suggested values for R and $\partial\theta/\partial z$ but with the supported minimum wind speed of four meters/second. The calculation for "half plume" fumigation assumes that half of the stack plume is instantaneously mixed in the vertical as soon as the plume centerline encounters the thermal internal boundary layer (TIBL). This assumption is quite conservative in that vertical mixing of the plume will actually occur over some time and distance downwind, as with normal Gaussian dispersion under unstable conditions.

The calculation for "half-plume" fumigation is based on the applicant's revised stack parameters for flue gas desulfurization in the FEIS. The results for the "half-plume" fumigation are calculated using the same equations and input values as presented in Table B-3 except as noted above. The result of this calculation indicates a maximum three-hour SO_2 concentration of about 360 ug/m^3. This value is well below the three-hour Federal SO_2 Prevention of Significant Deterioration limit of 512 ug/m^3. (This value of 360 ug/m^3 is also less than the worst case three-hour lake breeze fumigation concentration presented in Table B-3 of 412 ug/m^3 SO_2).

ESTIMATES OF GROUND LEVEL CONCENTRATIONS

B.010
Using the hour-by-hour Gaussian dispersion model, estimates of ground level concentrations of SO_2 were made for three-hour, 24-hour, and annual averaging periods. Annual 24-hour average TSP concentrations

were also calculated. The inversion breakup fumigation and lake breeze fumigation models were used only to estimate short-term SO_2 concentrations for comparison to the maximum three-hour average calculated with the hour-by-hour model. The estimates referred to in this section are ground level concentrations resulting from effluents released from the proposed facility stack along. Estimates of total ground level concentrations which include ambient background SO_2 and TSP levels are discussed in Chapter 4, "Impact of the Proposed Facility on Air Quality."

B.011
The proposed facility stack operating parameters are given in Table B-4. Calculations were made for three operating conditions - 100 percent, 75 percent, and 50 percent load. These stack operating parameters are based on the maximum expected facility emissions discussed in Section 1, "Air Quality Discharges." The stack exit temperature has been conservatively assumed to reflect no stack gas reheat in order to maximize the calculated pollutant concentrations. The results shown in Table 1-25 were computed using the hourly Gaussian dispersion model with the appropriate stack operating conditions and the hourly meteorological data described earlier. For each averaging period, the maximum calculated concentration is given. The averaging periods were selected to facilitate direct comparison to applicable Federal standards.

B.012
There are three meteorological conditions conducive to elevated short-term ground level concentrations of SO_2 resulting from stack emissions at the Somerset Site: (a) inversion breakup fumigation, (b) lake breeze fumigation, and (c) limited layer mixing ("trapping"). The first two situations have already been discussed in the previous section along with appropriate dispersion models. In the "trapping" situation, a ground-based unstable layer extends to above the final plume rise level with a capping inversion or stable layer above the unstable layer. The capping inversion or stable layer is assumed to be a perfect reflector, such that the contaminants in the plume are reflected towards the ground and do not diffuse through this stable layer. Ground level concentrations are highest when the atmosphere is very unstable ("A" or "B" stability), wind speeds are low, and the inversion base is slightly above final plume rise. The trapping situation is implicitly included in the hour-by-hour Gaussian dispersion model calculations. The maximum three-hour average SO_2 concentration associated with the lake breeze fumigation condition is 343 ug/m^3, whereas the maximum three-hour average SO_2 concentration due to the trapping condition is 200 ug/m^3. A maximum short-term SO_2 concentration of 341 ug/m^3 is estimated for the inversion breakup condition, and this concentration is estimated to have a duration of only 35 minutes.

TABLE B-4

DATA FOR DIFFUSION MODELS
PROPOSED (PRIME) EMISSION CONTROL SYSTEMS

Parameter	Units	Load	Proposed Facility
		%	
Flue Gas Flow Rate	10^6 lb/hr	100	9.67
		75	7.73
		50	5.97
Boiler Heat Input	10^6 Btu/hr	100	7,953
		75	5,700
		50	3,899
Coal Sulfur Content	% by weight	-	3.6%
Coal Heating Value	Btu/lb	-	12,000
SO_2 Removal Efficiency	%	-	80
SO_2 Emission Rate	lb SO_2/	100	1.2
	10^6 Btu heat	75	1.2
	input	50	1.2
	gm/sec	100	1,203
		75	862
		50	590
Particulate Emission	lb particulate/	100	0.05
	10^6 Btu heat	75	0.05
	input	50	0.05
	gm/sec	100	50.1
		75	35.9
		50	24.6
NO_x Emission Rate	lb $NO_x/10^6$ Btu	100	0.7
	heat	75	0.7
	input	50	0.7
	gm/sec	100	701
		75	503
		50	344
Exit Gas Temperature	°F	100	122
		75	122
		50	122

TABLE B-4 (Cont'd)

Parameter	Units	Load	Proposed Facility
		%	
Exit Velocity	ft/sec	100	80
		75	64
		50	49
Stack Height	ft	-	450

Therefore, the maximum three-hour average SO_2 concentration resulting from the plant alone is estimated to be 343 ug/m^3 due to a postulated worst case lake breeze fumigation. (It is of interest to note than an investigation of observational data collected between April and July 1974 showed six possible days with potential for lake breeze fumigations at the Somerset Site. Estimates of the three-hour average ground level SO_2 concentrations, made with the lake breeze fumigation model described earlier, did not exceed 262 ug/m^3 on any of these days). The 343 ug/m^3 value is 67 percent of the 512 ug/m^3 PSAQD standard.

B.013
The maximum calculated 24-hour average SO_2 concentration is 50 ug/m^3 or 55 percent of the 91 ug/m^3 standard. For TSP, the maximum 24-hour average is calculated to be 2.5 ug/m^3 or 7 percent of the 37 ug/m^3 standard. The maximum annual average SO_2 and TSP concentrations occur to the southeast of the Somerset Site at a distance of 22 km. The annual average SO_2 concentration due to the proposed facility is 1.3 ug/m^3 (7 percent of the 20 ug/m^3 standard) while the annual average TSP concentration resulting from the proposed facility is 0.07 ug/m^3 (0.4 percent of the 19 ug/m^3 standard).

B.014
In Chapter 4, "Impact of the Proposed Facility on Air Quality," total ground level concentrations which represent the sum of the proposed facility contribution and the ambient background are estimated for comparison to the National Ambient Air Quality Standards and the New York State Ambient Air Quality Standards.

B.015
Table B-5 presents information on atmospheric emissions in the four-county region surrounding the site. The information originally presented in Table B-5 of the DEIS ("Results of Gaussian Dispersion Model Calculations for the Proposed Facility Alone") is now contained in Table 1-25.

TABLE B-5 (Page 1 of 5)

POINT AND AREA SOURCE EMISSIONS
EMISSION INVENTORY SUMMARY - 1970[a]
PARTICULATE MATTER - TONS/YEAR

			Niagara County	Erie County	Orleans County	Genesee County
I.	Fuel Stationary Sources					
	Residential	Coal	228	530	56	35
		Oil	286	323	23	23
		Gas	13	220	2	5
	Commercial & Industrial	Coal	7,912	22,441	99	73
		Oil	350	2,225	35	76
		Gas	7	55	1	5
	Power Plant	Coal	0	9,578	0	0
		Oil	0	0	0	0
II.	Processes		22,019	51,020	665	4,874
III.	Solid Waste		560	1,055	135	186
IV.	Transportation					
	Gasoline		621	2,659	102	160
	Diesel		302	1,120	56	87
	Other		75	1,018	17	24
V.	Total		32,373	92,244	1,191	5,548

a. Taken from "New York State Implementation Plan to Achieve Air Quality Standards - Upstate New York," New York State Department of Environmental Conservation, 1972.

TABLE B-5 (Page 2 of 5)

POINT AND AREA SOURCE EMISSIONS
EMISSION INVENTORY SUMMARY - 1970
SULFUR DIOXIDE - TONS/YEAR

			Niagara County	Erie County	Orleans County	Genesee County
I.	Fuel Stationary Sources					
	Residential	Coal	380	883	93	58
		Oil	1,301	1,828	95	93
		Gas	1	13	0	0
	Commercial & Industrial	Coal	13,610	18,493	292	581
		Oil	15,619	26,126	811	1,806
		Gas	0	0	0	0
	Power Plant	Coal	0	66,053	0	0
		Oil	0	0	0	0
II.	Processes		7,791	14,333	0	1
III.	Solid Waste		37	267	1	2
IV.	Transporation					
	Gasoline		221	914	36	57
	Diesel		124	499	23	36
	Other		29	355	6	8
V.	Total		39,113	129,764	1,357	2,642

TABLE B-5 (Page 3 of 5)

POINT AND AREA SOURCE EMISSIONS
EMISSION INVENTORY SUMMARY - 1970
NITROGEN DIOXIDE - TONS/YEAR

			Niagara County	Erie County	Orleans County	Genesee County
I.	Fuel Stationary Sources					
	Residential	Coal	304	706	74	47
		Oil	2,029	2,350	167	153
		Gas	239	3,953	27	92
	Commercial & Industrial	Coal	6,700	394	64	133
		Oil	1,757	28,354	366	788
		Gas	130	674	12	93
	Power Plant	Coal	0	17,114	0	0
		Oil	0	0	0	0
II.	Processes		111	1,936	0	0
III.	Solid Waste		45	300	3	4
IV.	Transportation					
	Gasoline		4,270	17,561	1,942	3,064
	Diesel		605	2,440	112	174
	Other		237	1,719	110	152
V.	Total		16,427	77,501	2,877	4,700

TABLE B-5 (Page 4 of 5)

POINT AND AREA SOURCE EMISSIONS
EMISSION INVENTORY SUMMARY - 1970
CARBON MONOXIDE - TONS/YEAR

			Niagara County	Erie County	Orleans County	Genesee County
I.	Fuel Stationary Sources					
	Residential	Coal	759	1,766	186	117
		Oil	56	70	5	4
		Gas	0	0	0	0
	Commercial & Industrial	Coal	315	1,291	46	155
		Oil	6	146	3	42
		Gas	0	0	0	0
	Power Plant	Coal	0	855	0	0
		Oil	0	0	0	0
II.	Processes		3,305	133	0	0
III.	Solid Waste		1,295	1,946	451	619
IV.	Transporation					
	Gasoline		106,992	442,345	17,069	27,073
	Diesel		165	666	31	48
	Other		440	1,661	356	492
V.	Total		113,333	450,879	18,147	28,550

TABLE B-5 (Page 5 of 5)

POINT AND AREA SOURCE EMISSIONS
EMISSION INVENTORY SUMMARY - 1970
HYDROCARBONS - TONS/YEAR

			Niagara County	Erie County	Orleans County	Genesee County
I.	Fuel Stationary Sources					
	Residential	Coal	759	106	11	7
		Oil	56	161	12	11
		Gas	0	1,537	11	36
	Commercial & Industrial	Coal	302	408	51	113
		Oil	28	283	19	19
		Gas	0	120	5	42
	Power Plant	Coal	0	171	0	0
		Oil	0	0	0	0
II.	Processes		3,364	3,452	263	26
III.	Solid Waste		1,295	1,946	361	495
IV.	Transportation					
	Gasoline		16,753	69,265	2,673	4,240
	Diesel		880	3,550	163	253
	Other		802	4,644	556	770
V.	Total		24,239	85,643	4,125	6,012

TABLE B-5 (Page 4 of 5)

POINT AND AREA SOURCE EMISSIONS
EMISSION INVENTORY SUMMARY - 1970
CARBON MONOXIDE - TONS/YEAR

			Niagara County	Erie County	Orleans County	Genesee County
I.	Fuel Stationary Sources					
	Residential	Coal	759	1,766	186	117
		Oil	56	70	5	4
		Gas	0	0	0	0
	Commercial & Industrial	Coal	315	1,291	46	155
		Oil	6	146	3	42
		Gas	0	0	0	0
	Power Plant	Coal	0	855	0	0
		Oil	0	0	0	0
II.	Processes		3,305	133	0	0
III.	Solid Waste		1,295	1,946	451	619
IV.	Transporation					
	Gasoline		106,992	442,345	17,069	27,073
	Diesel		165	666	31	48
	Other		440	1,661	356	492
V.	Total		113,333	450,879	18,147	28,550

TABLE B-5 (Page 5 of 5)

POINT AND AREA SOURCE EMISSIONS
EMISSION INVENTORY SUMMARY - 1970
HYDROCARBONS - TONS/YEAR

			Niagara County	Erie County	Orleans County	Genesee County
I.	Fuel Stationary Sources					
	Residential	Coal	759	106	11	7
		Oil	56	161	12	11
		Gas	0	1,537	11	36
	Commercial & Industrial	Coal	302	408	51	113
		Oil	28	283	19	19
		Gas	0	120	5	42
	Power Plant	Coal	0	171	0	0
		Oil	0	0	0	0
II.	Processes		3,364	3,452	263	26
III.	Solid Waste		1,295	1,946	361	495
IV.	Transportation					
	Gasoline		16,753	69,265	2,673	4,240
	Diesel		880	3,550	163	253
	Other		802	4,644	556	770
V.	Total		24,239	85,643	4,125	6,012

APPENDIX C: FIGURES RELATING TO THERMAL DISCHARGE

FIGURE C-1

SURFACE ISOTHERMS FOR RUN NO. 66

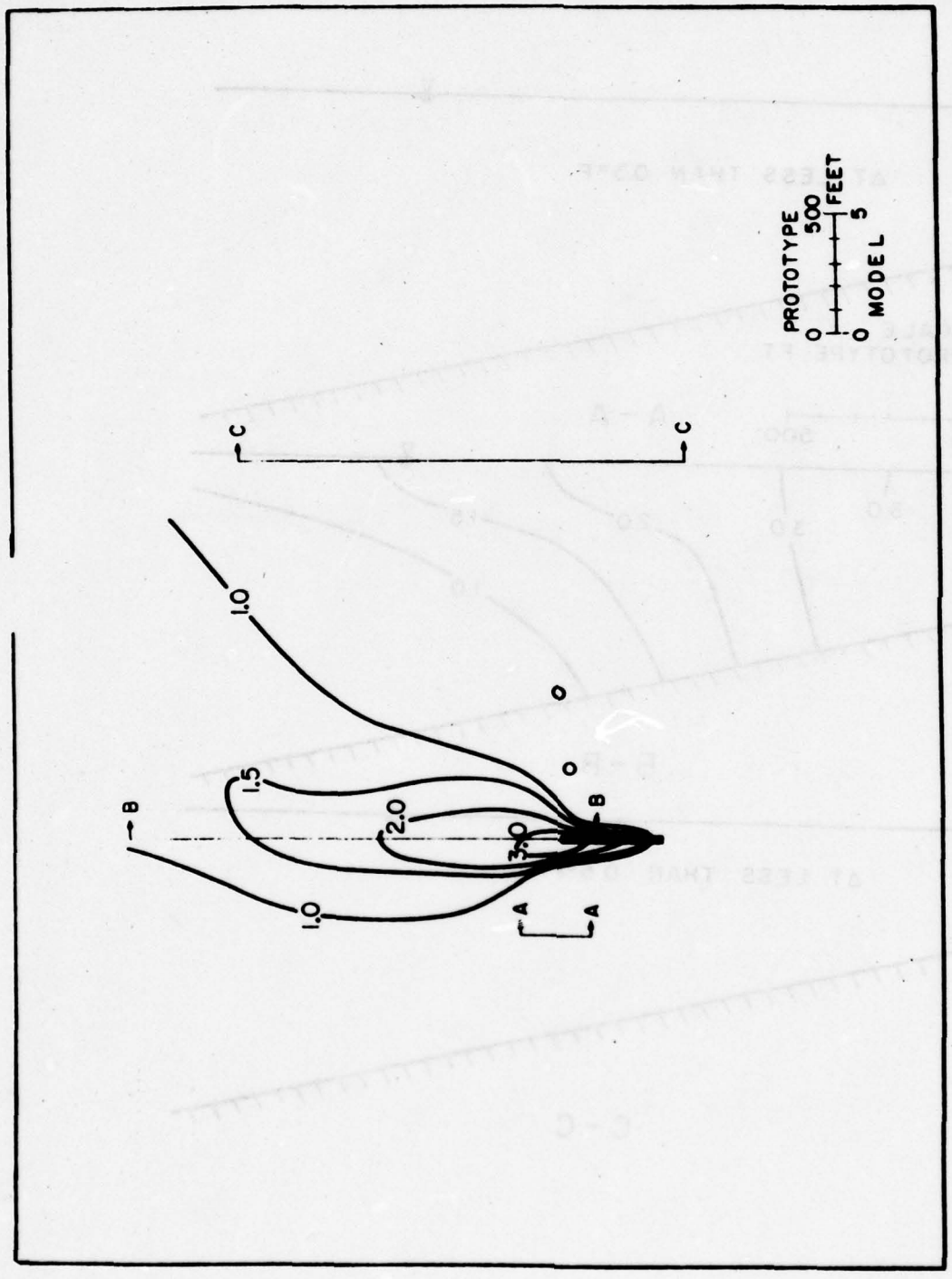


FIGURE C-2

VERTICAL CROSS-SECTIONS FOR RUN 66

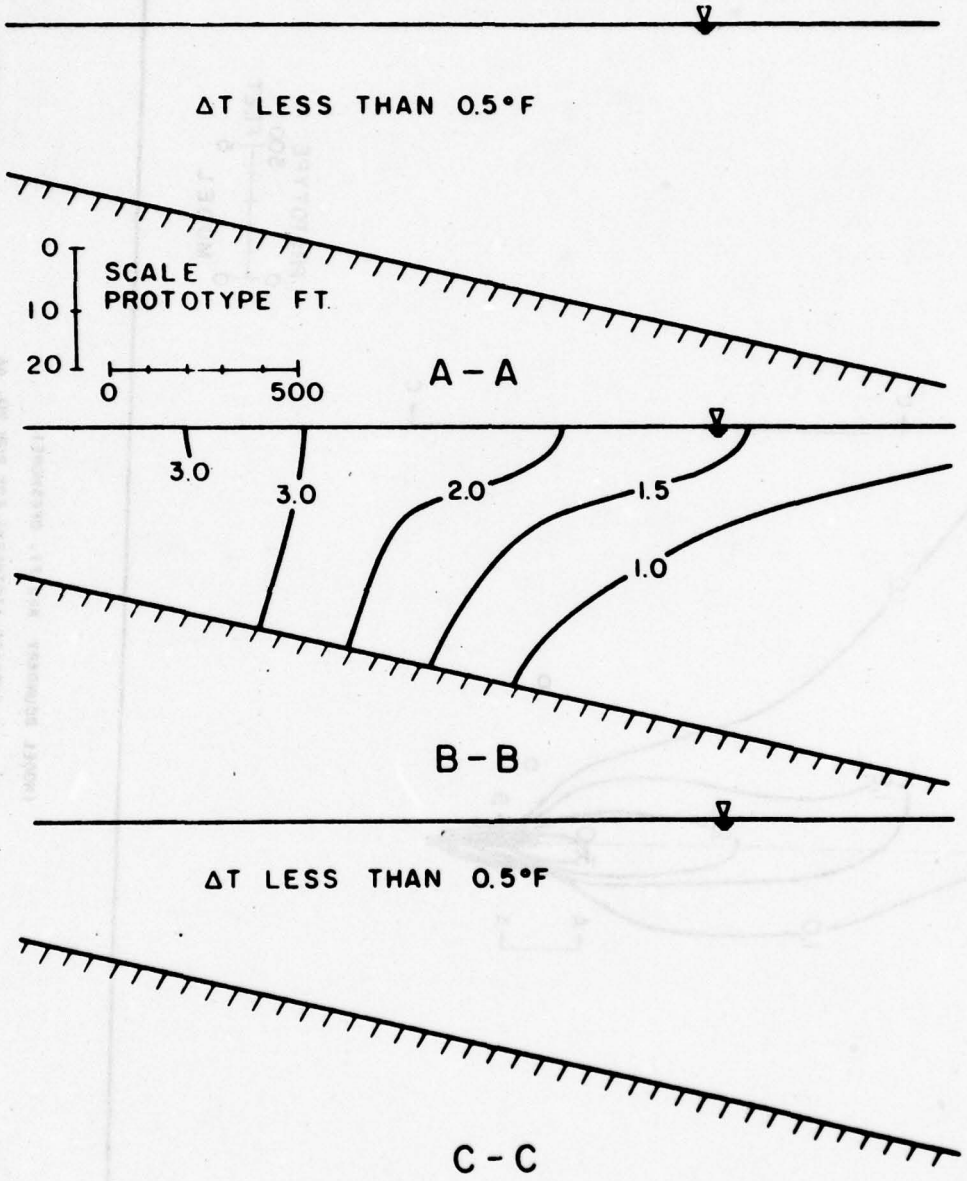


FIGURE C-3

SURFACE ISOTHERMS FOR RUN NO. 64

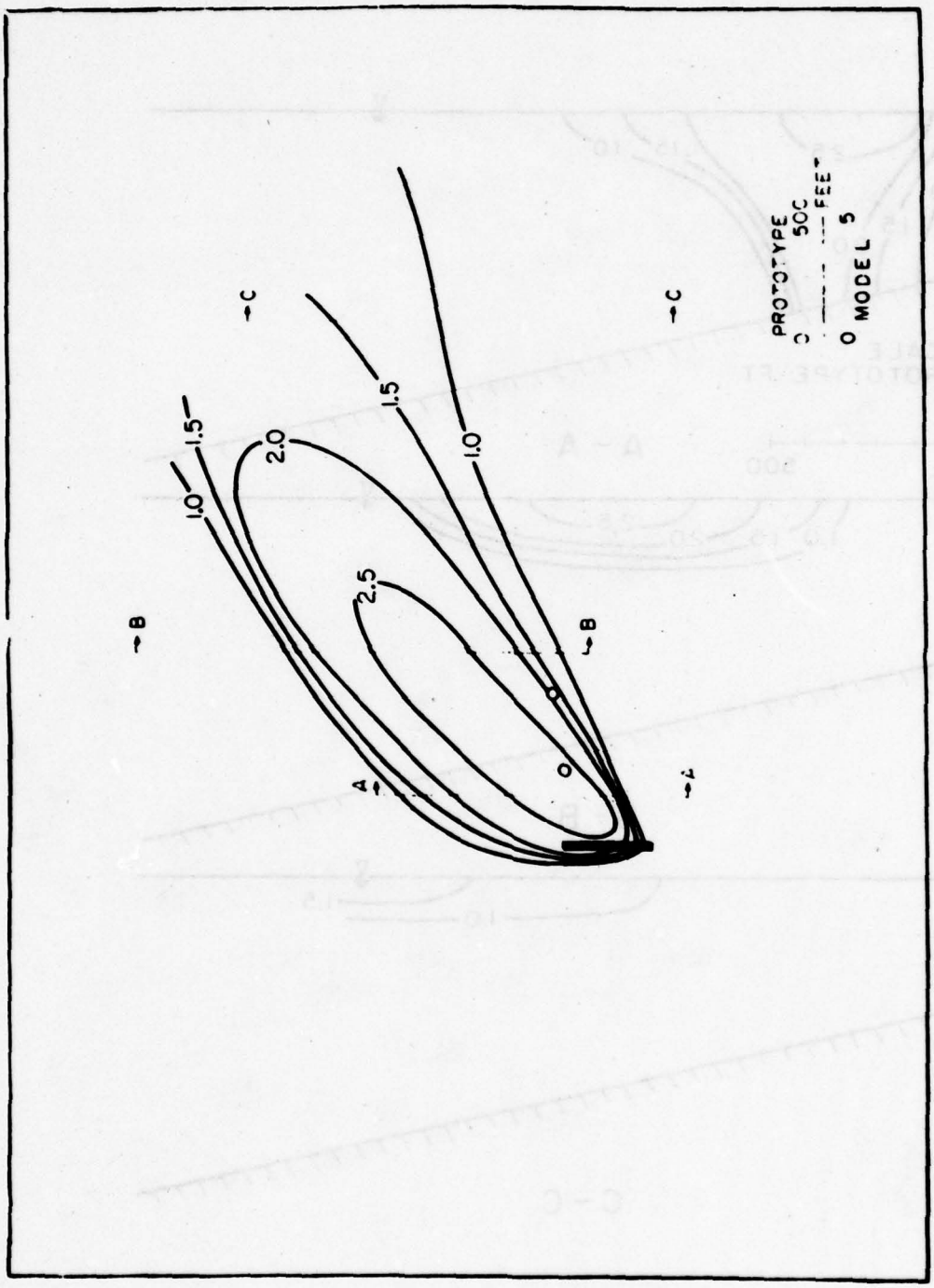


FIGURE C-4

VERTICAL CROSS-SECTIONS FOR RUN 64

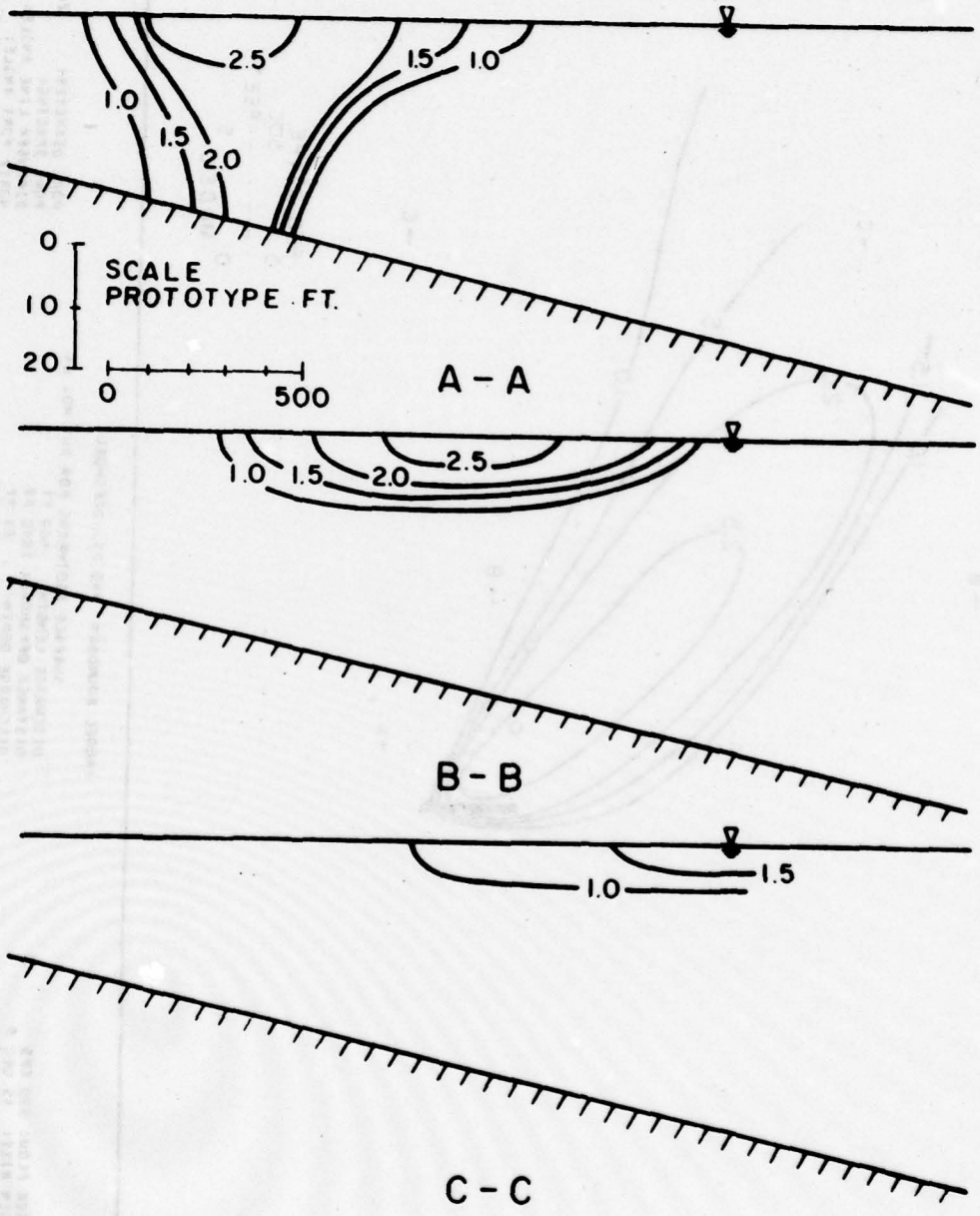
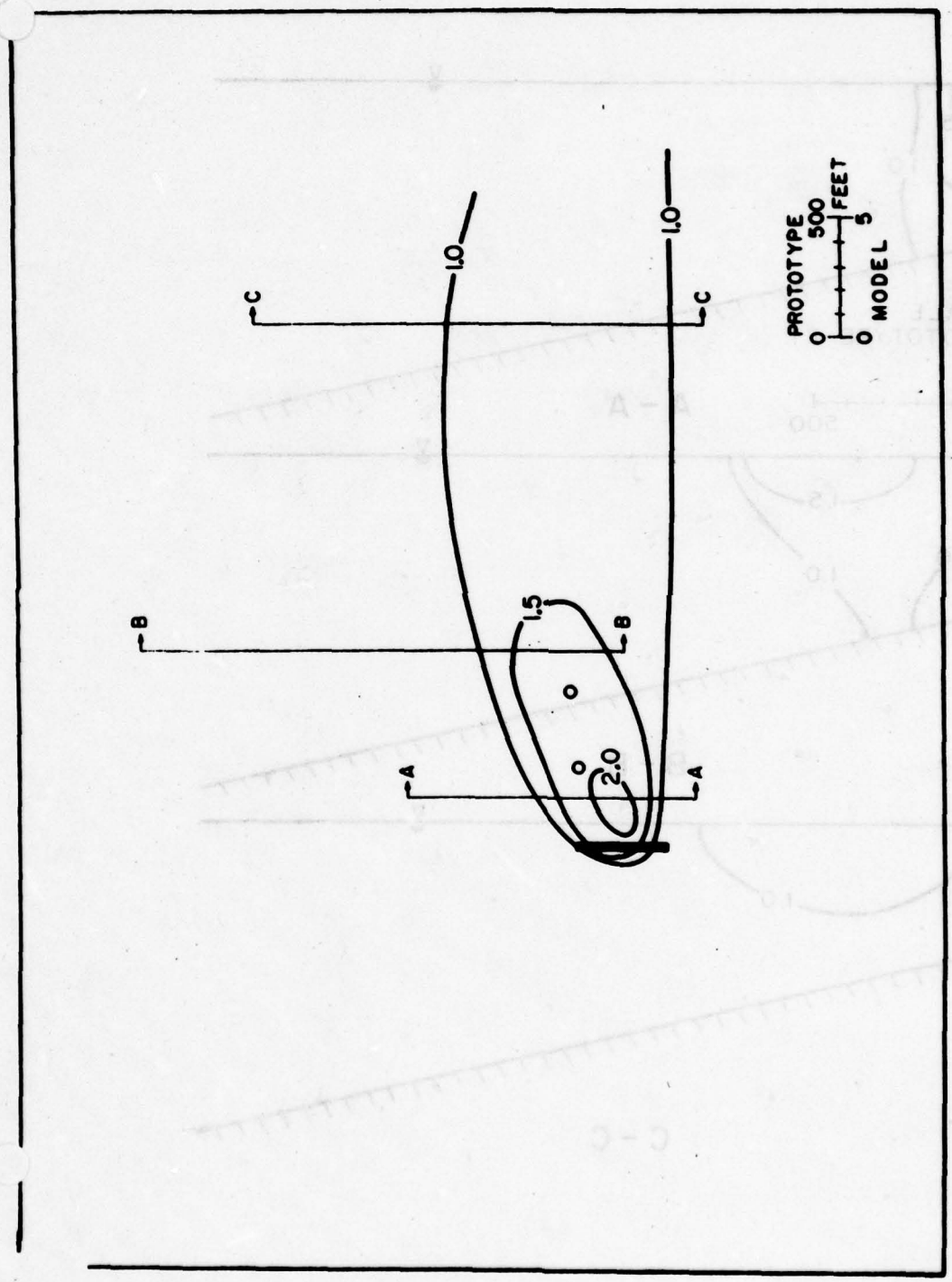


FIGURE C-5

SURFACE ISOTHERMS FOR RUN NO. 65



(MODEL BOUNDARY 840 FT. OFFSHORE)

SURFACE ISOTHERMS FOR RUN NO. 65

DISCHARGE LENGTH: 400 FT
DISTANCE OFFSHORE: 1840 FT
DISCHARGE DEPTH: 25 FT
DISCHARGE VELOCITY: 15 FPS

PORT DIAMETER: 2.24 FT
PORT SPACING: 53 FT
DIFFUSER LIVE ANGLE: 3 DEG
HORIZ PORT ANGLE: 25 DEG
VERTICAL PORT ANGLE: [illegible]

CONDENSER FLOW: 530 CFS
CONDENSER RISE: 35 DEG F
INTAKE RISE: 1.4 DEG F
AMBIENT TEMP: 59.7 DEG F
CURRENT SPEED: 0.60 FPS

FIGURE C-6

VERTICAL CROSS-SECTION FOR RUN 65

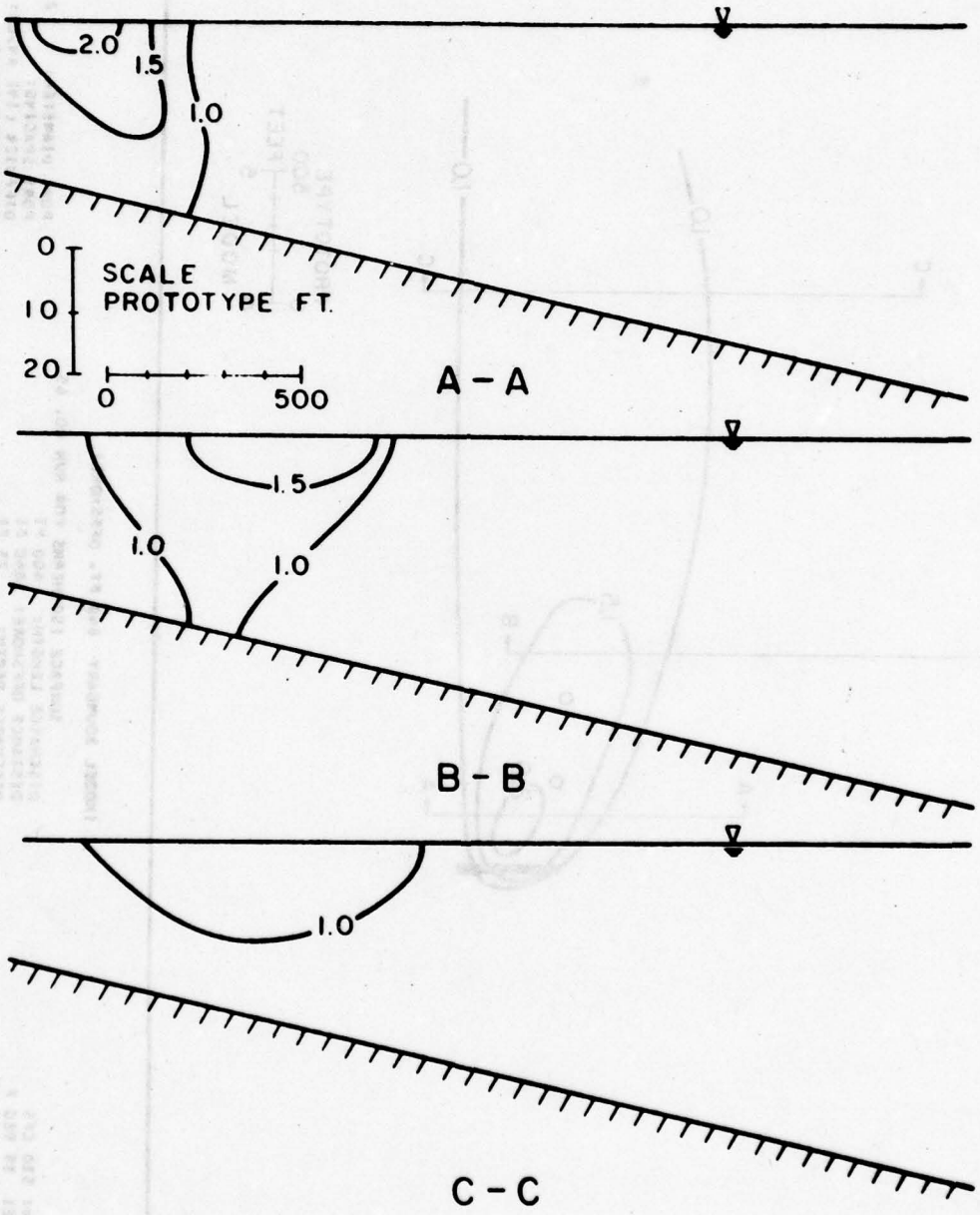
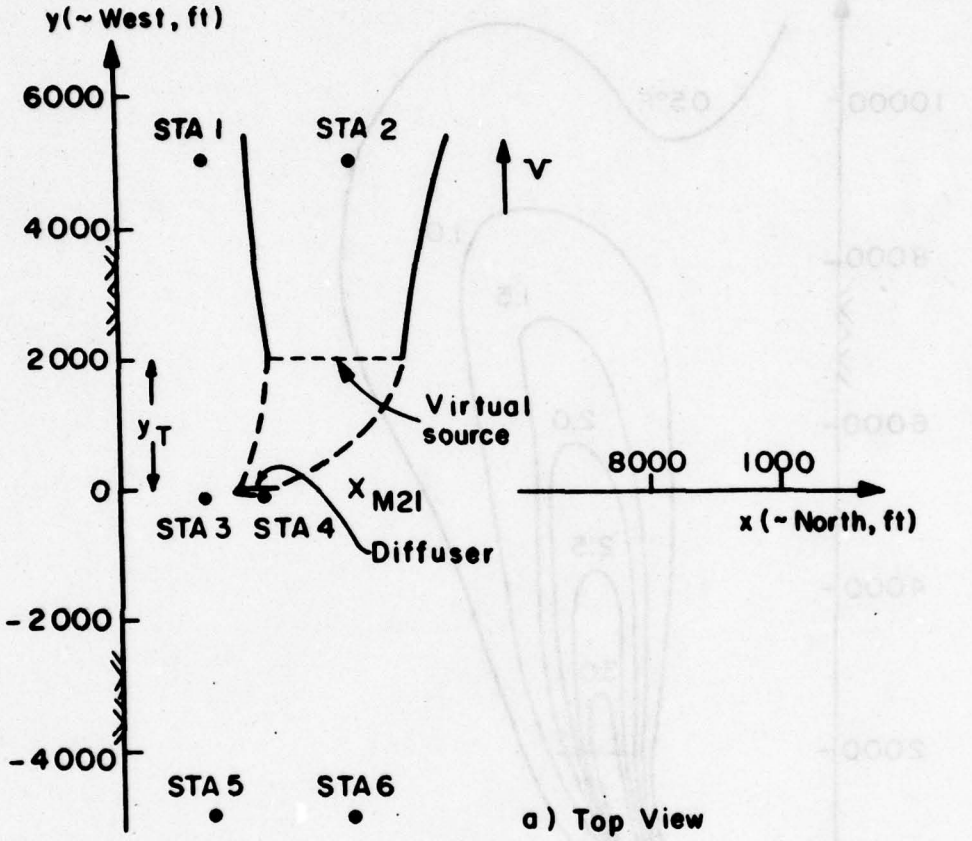
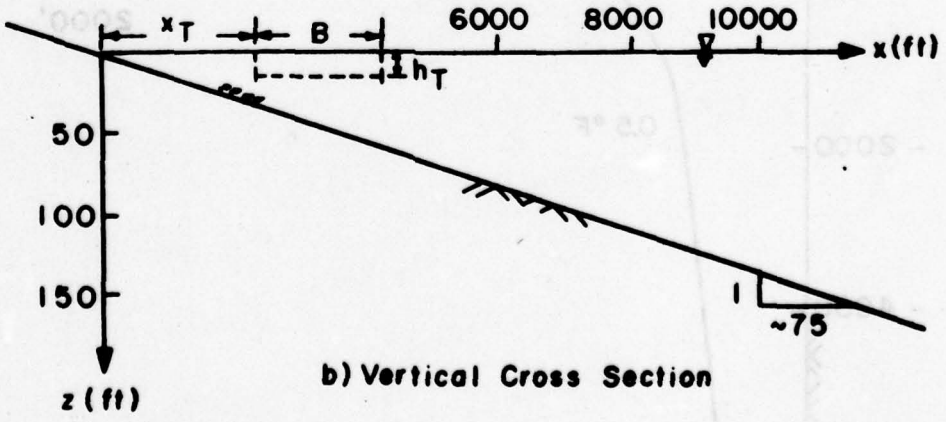


FIGURE C-7

APPLICATION OF TRANSIENT PLUME MODEL TO SOMERSET SITE



a) Top View



b) Vertical Cross Section

FIGURE C-8

FAR FIELD SURFACE ISOTHERM PLOTS
(April 1, 1974 2300-Base Case Parameters)

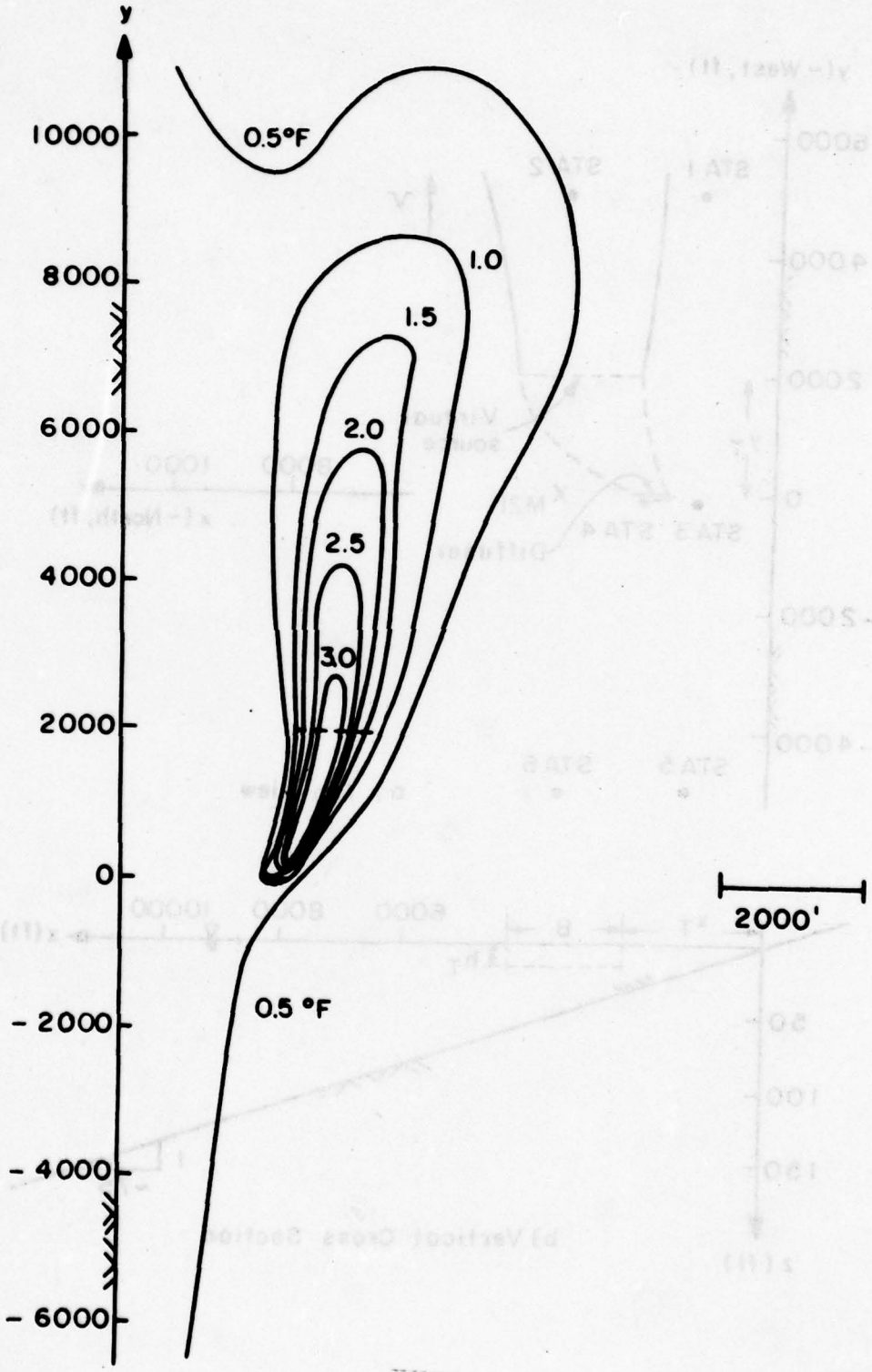


FIGURE C-9

FAR FIELD SURFACE ISOTHERM PLOTS
(July 12, 1974 2300-Base Case Parameters)

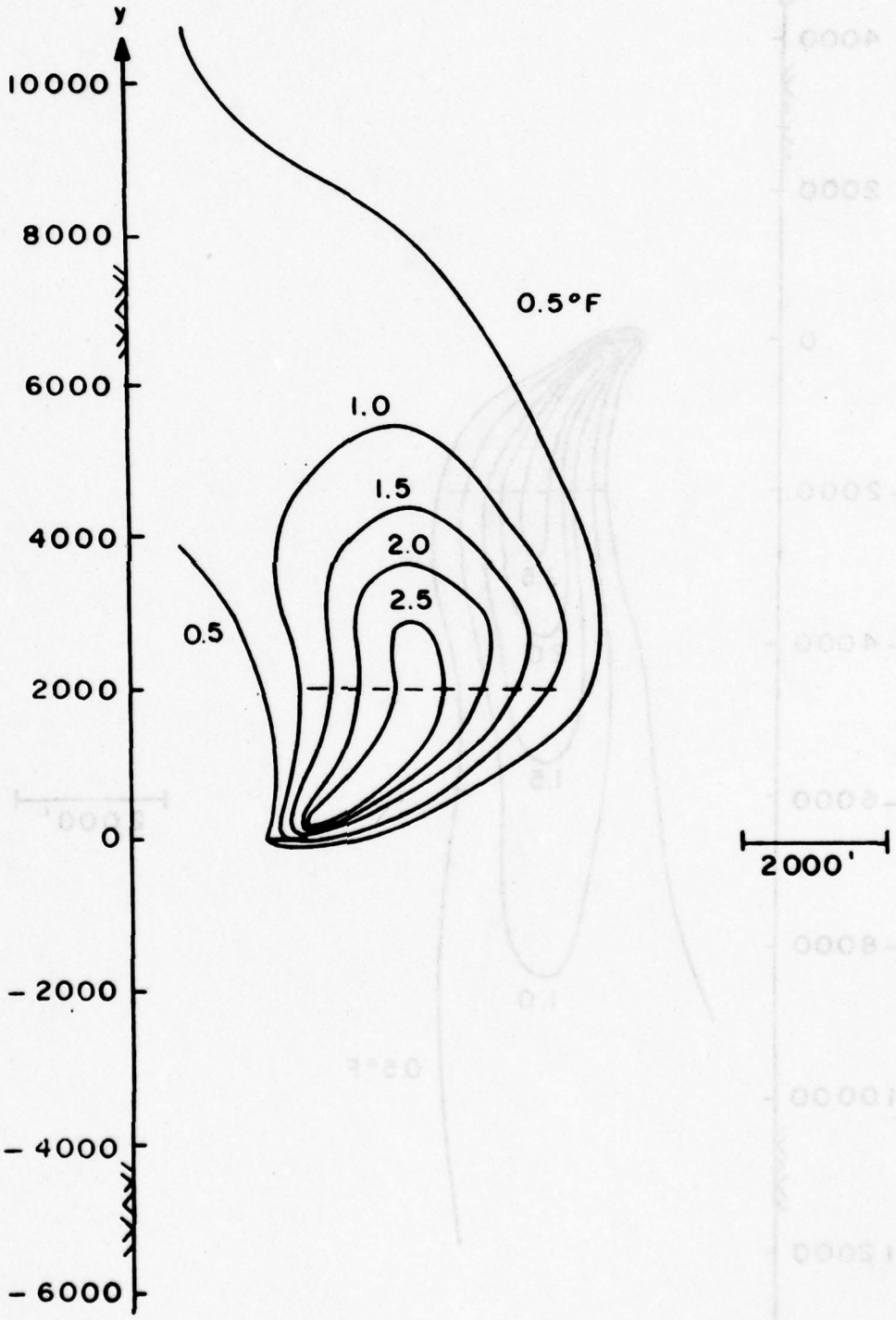


FIGURE C-10

FAR FIELD SURFACE ISOTHERM PLOTS
(Sept. 22, 1974 2300-Base Case Parameters)

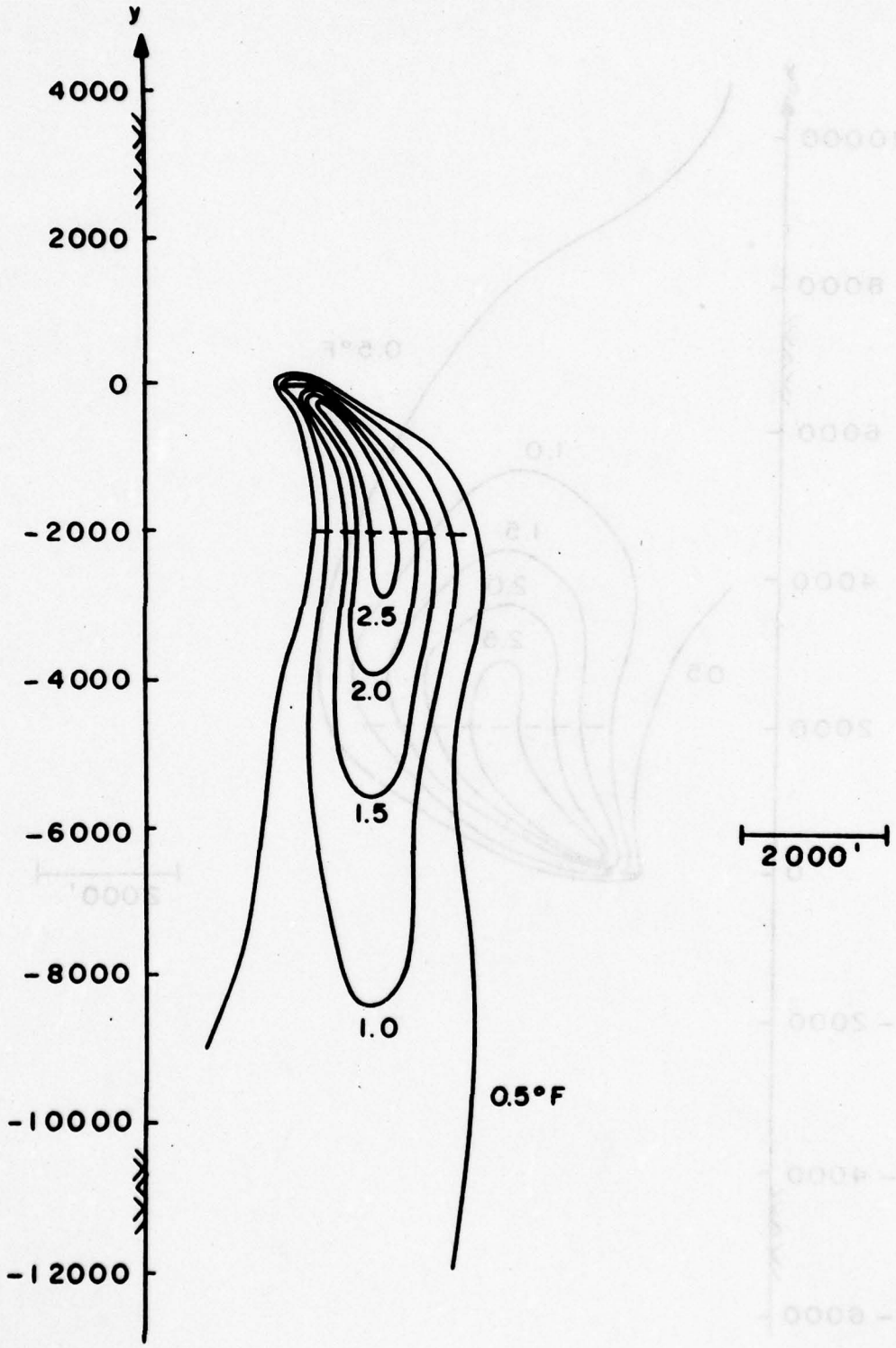


FIGURE C-11

FAR FIELD SURFACE ISOTHERM PLOTS
(January 17, 1975 2300-Base Case Parameters)

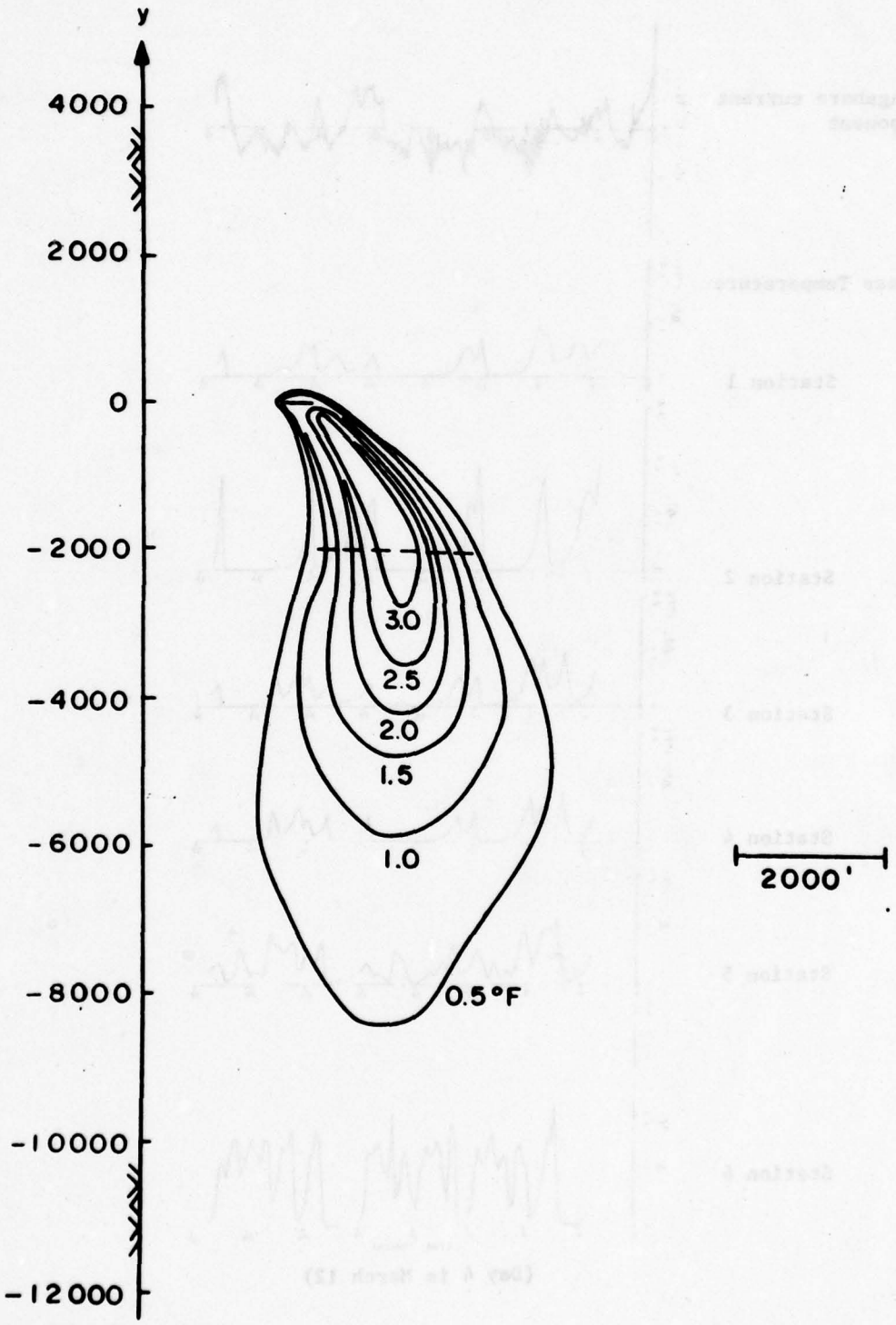
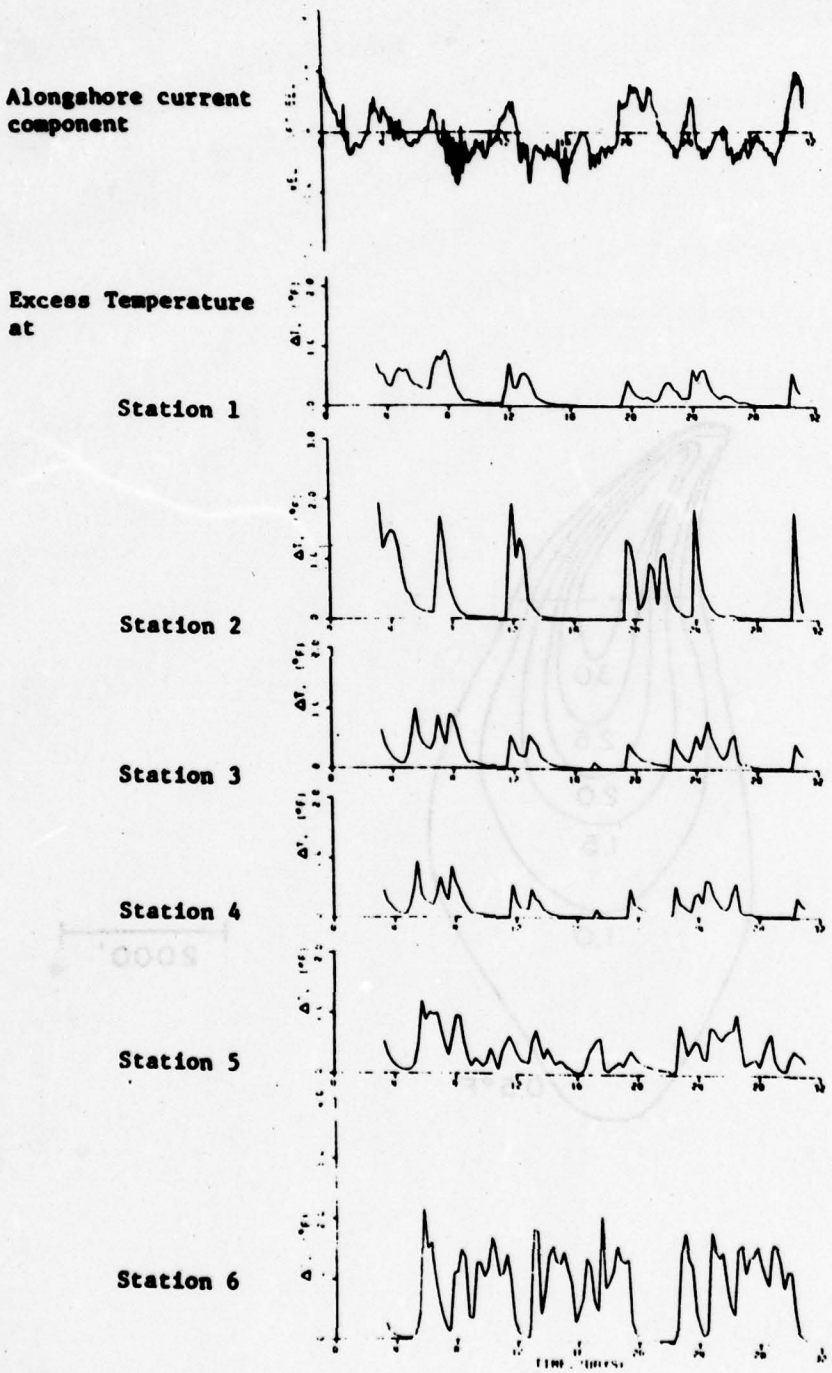


FIGURE C-12

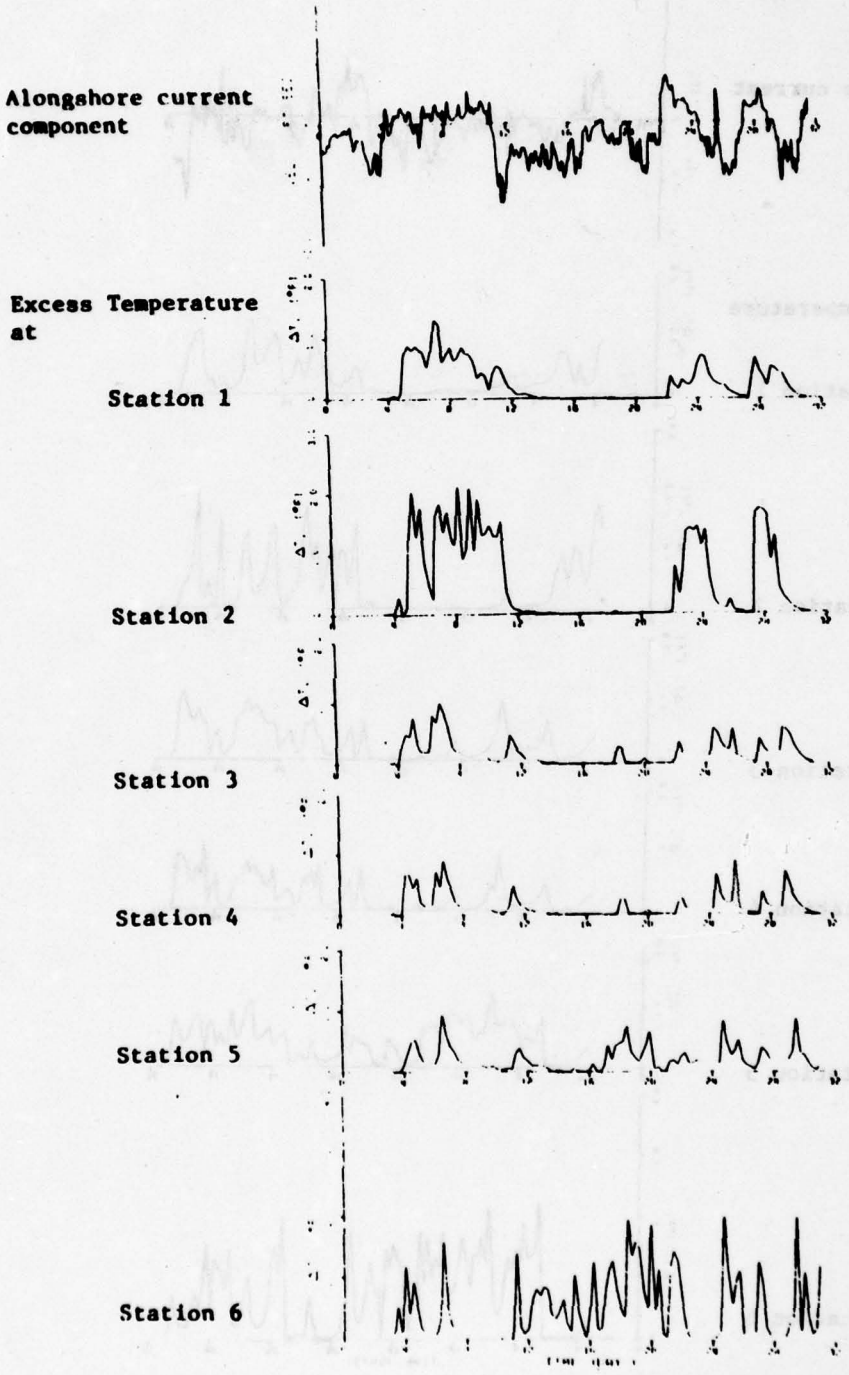
TIME SERIES PLOTS OF ALONGSHORE CURRENT SPEEDS AND EXCESS TEMPERATURES
(March 12 through April 8, 1974-Base Case Parameters)



(Day 4 is March 12)

FIGURE C-13

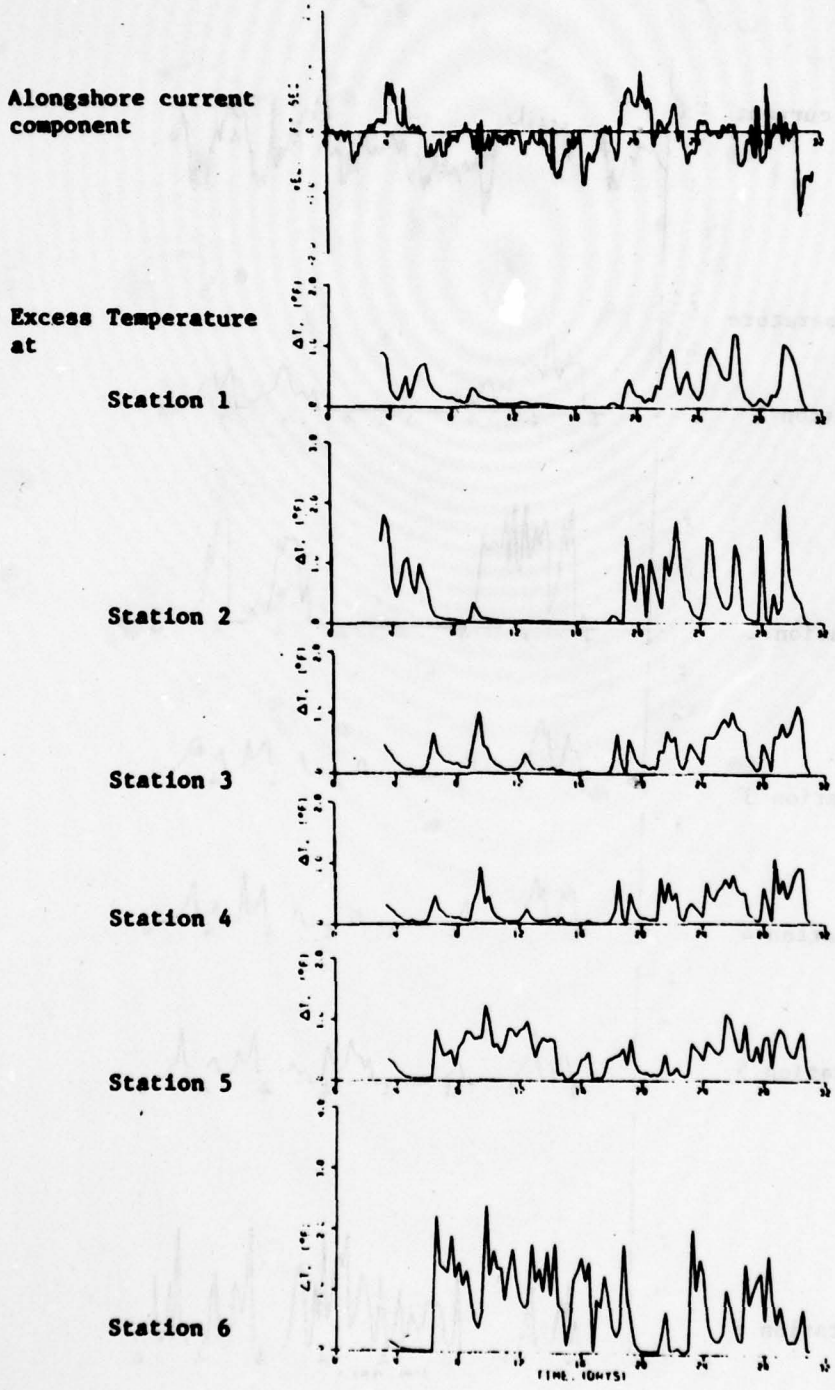
TIME SERIES PLOTS OF ALONGSHORE
CURRENT SPEEDS AND EXCESS TEMPERATURES
(June 22 through July 19, 1974-Base Case Parameters)



(Day 4 is June 22)

FIGURE C-14

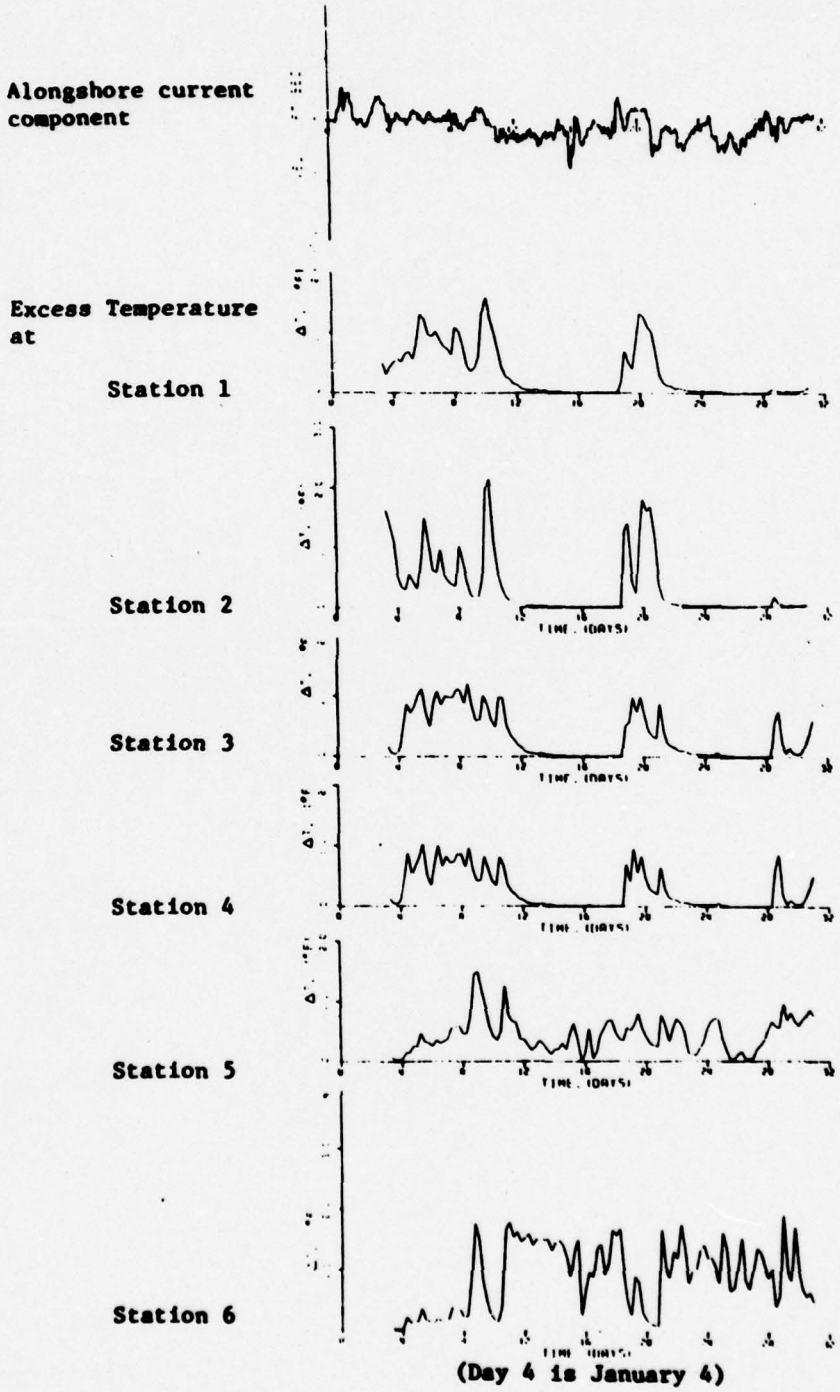
TIME SERIES PLOTS OF ALONGSHORE CURRENT SPEEDS AND EXCESS TEMPERATURES (September 2 through September 29, 1974-Base Case Parameters)



(Day 4 is September 2)

FIGURE C-15

TIME SERIES PLOTS OF ALONGSHORE CURRENT SPEEDS AND EXCESS TEMPERATURE (January 4 through January 31-Base Case Parameters)



(Day 4 is January 4)

APPENDIX D: ANALYSIS OF PROPOSED FILL ACTIVITY PURSUANT TO SECTION 404(b) OF THE FEDERAL WATER POLLUTION CONTROL ACT OF 1972

INTRODUCTION

D.001
Part 323 of Title 33, Code of Federal Regulations (33CFR 323) describes the policies and procedures to be followed by the Corps of Engineers in connection with the review of applications for Department of the Army permits to authorize the discharge of dredged or fill materials into waters of the United States pursuant to Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (33 USC 1344). Such a permit, referred to as a 404 permit, is required of the applicant in this case for the placement of 30,000 cubic yards of select backfill associated with the placement of the intake and discharge structures and pipelines in Lake Ontario.

D.002
Corps staff has reviewed the information supplied by the applicant concerning this activity and has prepared an analysis of the projected impacts on environmental factors as described in guidelines developed by the U. S. Environmental Protection Agency and published under 40 CFR 230. The results of this analysis show that the placement of this fill material in Lake Ontario will not have any significant environmental effects. The following paragraphs describe the environmental factors analyzed and the projected impact on each factor.

GENERAL DESCRIPTION

D.003
The fill material will be used to fill a trench approximately 1,100 feet long and 50 feet wide in which the intake and discharge pipes will be laid. This trench extends from the shore to the 15-foot contour and is shown in Figure 1-5. The material will consist of clean sand and clean crushed rock. In addition, the intake and discharge pipes will be covered with clean crushed rock from the end of the trench lakeward to the intake and discharge structures, a distance of approximately 1,200 feet for each pipe, as shown in Figure 1-5. The base of the crushed rock, shown as bedding and riprap in Figure 1-7, will be approximately 50 feet wide. The total surface area to be

NOTE: The material contained in Appendix D of the DEIS ("FGD System Conceptual Design") has been incorporated into Chapter 1 of the FEIS. It has been replaced with the following analysis of the impact of the placement of backfill for the intake and discharge structures and pipelines.

covered, using the dimensions in Figure 1-5, is approximately 192,500 square feet. The estimated volume of the fill material to be used is 30,000 cubic yards.

ENVIRONMENTAL FACTORS AND ASSOCIATED IMPACTS

D.004
The following factors have been analyzed and impacts projected. The number associated with each factor refers to the section in 40 CFR 230 in which it is addressed. In many cases, additional information is presented in the text of the EIS and paragraph numbers are referenced.

Changes in Bottom Geometry 230.4-1(a)

D.005
Approximately 192,500 square feet will be altered with the possible exception of the trench. Rock fill will be triangular in cross section as shown in Figure 1-7 and linear as shown in Figure 1-5.

Effect on Circulation Patterns 230.4-1(a)

D.006
Effect on circulation patterns is expected to be insignificant. Circulation patterns are discussed in paragraphs 2.179 through 2.190.

Alteration of Bottom Substrate Composition 230.4-1(a)

D.007
The bottom substrate consists of sand and rock as described in paragraph 1.046. Therefore, no significant alteration of substrate composition will occur.

Light Transmissions 230.4-1(a)(2)

D.008
Turbidity associated with fill activities may cause a temporary and insignificant decrease in light transmission.

Aesthetics 230.4-1(a)(2)

D.009
The fill activity will have no effect on aesthetics other than the visual and possibly auditory presence of workers and equipment on the lake.

Changes in Nektonic and Planktonic Populations 230.4-1(a)(2)

D.010
No significant population changes are expected as a result of this operation. Temporary decreases in population may occur during the fill operation.

Covering of Benthic Communities 230.4-1(a)(3)

D.011
A maximum of 192,500 square feet will be covered. This is a conservative estimate and in any case the area will be already disturbed by construction activities not covered by a 404 permit. The covering is considered insignificant due to the relative size of the project and the ability of benthic communities to recolonize.

Changes in Community Structure or Function (including enhancement) 230.4-1(a)(3)

D.012
No significant changes are expected to result from the fill operation.

Substrate Quality 230.5(a)(1)

D.013
Since the fill material is clean sand and crushed stone, no changes in substrate quality are expected.

Impedence of Normal Water Level Fluctuation 230.5(a)(1)

D.014
The fill activity will not impede normal water level fluctuation.

Food Chain 230.5(a)(2)

D.015
The fill activity will destroy benthic organisms and possibly render the immediate environment temporarily unsuitable for plankton or higher aquatic organisms. The food chain may be thus impacted but only in a temporary and insignificant manner.

Alteration and Decrease in the Diversity of Flora and Fauna 230.5(a)(2)

D.016
These effects should be temporary and insignificant due to the nature of the fill material and the temporary nature of the activity. See paragraph F.015 above.

Inhibition of Faunal Movement During Migration and Spawning Periods 230.5(a)(3)

D.017
The fill activity will not inhibit faunal movement during migration and spawning activities.

Areas Responsible for the Retention of High Waters of Flood Waters 230.5(a)(5)

D.018
The fill activity will have no effect on these areas.

Turbidity Levels 230.5(a)(6)

D.019
The fill activity will cause increased levels of turbidity in the immediate area of the intake and discharge structures. This effect will be temporary and will not have permanent significant ecological effects.

Recreation 230.5(a)(7)

D.020
The project area is not conducive to swimming as described in paragraph 2.061. The fill activity may interfere with fishing, boating, or water skiing in the immediate area during the construction period. This impact is expected to be insignificant. See paragraph 4.029.

Economic Values 230.5(a)(7)

D.021
The placement of fill material will have no effect on economic values in the area.

Water Quality 230.5(a)(8)

D.022
The placement of the fill may cause a temporary decrease in water quality due to increased turbidity caused by the filling activity. The fill material is clean sand and crushed stone and will have no effect on water quality once the turbidity from construction has cleared up.

Municipal Water Supply Intakes 230.5(b)(1)

D.023
The fill activity will have no effect on municipal water supply intakes. Paragraphs 2.066 through 2.074 discuss water supply and consumption.

Fish Spawning and Nursery Areas 230.5(b)(3)(i)

D.024
Since some spawning activity occurs in the vicinity of the site, some spawning areas may be destroyed by the fill activity. However, other construction activity will have already affected much of the area covered by the fill. The major species affected would be alewife and possibly rainbow smelt, and the effect of the fill activity on lakewide populations of these species is insignificant. Fish spawning is discussed in more detail in paragraphs 2.260 through 2.265 and Table 2-27 presents spawning time, temperature, and location of common fish species in Lake Ontario.

Interference with Spawning Cycles and Migration Patterns or Routes 230.5(b)(3)(ii)

D.025
The fill activity may have an effect on spawning cycle of alewife in the immediate vicinity of the site. Since this species spawns commonly in the general vicinity of the site, no significant effects on populations of alewife or any other species are expected. No effects on migration patterns or routes are expected.

Submerged and Emergent Vegetation (Spawning Substrate, cover, etc.) 230.5(b)(3)(iii)

D.026
No vegetation exists in the area of the activity with the exception of the filamentous green algae Cladophora (paragraph 2.244). Thus the fill activity will have no effect on submerged and emergent vegetation.

Water Use Effects: Wildlife Habitat 230.5(b)(4)

D.027
The presence of workers and equipment may preclude use of the immediate area by waterfowl during periods of construction activity but the permit action will not have any effects on wildlife habitat.

Food Chain 230.5(b)(4)

D.028
Effects of the fill activity on the wildlife food chain will be insignificant due to the relative size of the project area and the mobility of predator and prey species. See paragraph F.015 for possible effects on lower levels of the food chain.

Community Structure 230.5(b)(4)

D.029
The fill activity will have no significant effect on community structure in Lake Ontario or the immediate area.

Water Use Effects: Recreation Water Color, Taste & Odor 230.5(b)(5)(i)

D.030
Placement of fill material may cause temporary effects on water color due to increased turbidity but this impact will not be significant. See paragraphs 2.061 and F.020.

Eutrophication as it Contributes to Degration of Aesthetic Values and Impairment of Recreational Use 230.5(b)(5)(ii)

D.031
The fill material consists of clean sand and crushed stone and will not contribute to eutrophication.

Water Contact Sports and Recreation 230.5(b)(5)(iii)

D.032
The fill activity will not have any adverse long-term effect on water contact sports or recreation. During the construction period, the presence of equipment may affect the use of the immediate area for boating, fishing, or water skiing. See paragraph 4.029.

Oil and Grease Levels 230.5(b)(5)(iii)

D.033
Accidental spills or leakage of oil and grease from construction equipment could take place but the probability of this occurrence is small since all reasonable precautions will be taken.

Pathogenic Organism Levels 230.5(b)(5)(iv)

D.034
The proposed activity will have no effect on levels of pathogenic organisms.

APPENDIX E

PRE-DRAFT AND POST-DRAFT EIS COORDINATION LETTERS

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S

8 March 1977

Orin Lehman, Commissioner
NYS Office of Parks and Recreation
Agency Building No. 1
Empire State Plaza
Albany, NY 12238

Dear Mr. Lehman:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the New York State Electric and Gas Corporation to construct an 850 mw coal fired steam electric power generating station on the east shore of Cayuga Lake, Town of Lansing, Tompkins County, New York, or alternatively on the south shore of Lake Ontario in the Town of Somerset, Niagara County, New York.

As a part of the data input for the EIS, we have requested NYSEG to perform cultural resource inventories at both project sites. These studies were recently completed and a copy of their findings is enclosed for your review and evaluation.

Please forward your comments to Mr. Paul Leuchner of my Regulatory Functions Branch, as soon as possible, so that they may be incorporated into the EIS. If you have any questions, please contact Mr. Leuchner by calling A/C 716, 876-5454, extension 2321.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

Incl
as stated

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S

8 March 1977

Mr. Dave Clark
National Park Service
North Atlantic Region
150 Causeway Street
Boston, MA 02114

Dear Mr. Clark:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the New York State Electric and Gas Corporation to construct an 850 mw coal fired steam electric power generating station on the east shore of Cayuga Lake, Town of Lansing, Tompkins County, New York, or alternatively on the south shore of Lake Ontario in the Town of Somerset, Niagara County, New York.

As a part of the data input for the EIS, we have requested NYSEG to perform cultural resource inventories at both project sites. These studies were recently completed and a copy of their findings is enclosed for your review and evaluation.

Please forward your comments to Mr. Paul Leuchner of my Regulatory Functions Branch, as soon as possible, so that they may be incorporated into the EIS. If you have any questions, please contact Mr. Leuchner by calling A/C 716, 876-5454, extension 2321.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

Incl
as stated

United States Department of the Interior

NATIONAL PARK SERVICE
Office of Archeology and Historic Preservation
Interagency Archeological Services - Atlanta
730 Peachtree Street, Room 1010
Atlanta, Georgia 30308

IN REPLY REFER TO:

MAR 2 2 1977

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Attention: Paul Leuchner, Regulatory Functions Branch

Dear Mr. Leuchner:

We have received and reviewed the report of the cultural resources survey for the proposed Cayuga site and Somerset Alternate site for an electric power generating station proposed by the New York State Electric and Gas Corporation. The work done in the field investigation was adequate. The evaluations of National Register eligibility and prospective project impacts are somewhat weak.

If the Somerset Alternate site is chosen, three historic sites (the J. H. Pettit farm, the Badgley house and the Van Wagoner house) will have to be taken into consideration as sites potentially eligible for the National Register. Enough information may already be available for a determination of eligibility for the Badgley and Van Wagoner houses. Additional investigation will probably be needed to acquire sufficient information on the J. H. Pettit farm.

A statement of the qualifications of Gordon C. DeAngelo, the consultant on historic materials is needed, since all references to him cite only "personal communication".

Some of the "test pits" at the Somerset Alternate site were in fact surface examinations in plowed fields. It should be noted that these are not directly comparable to other test pits.

As noted above, the fieldwork to date is adequate. If the Somerset Alternate site is chosen, additional cultural resources work will be necessary.

Thank you for giving us the opportunity to comment of this project.

Sincerely yours,

Wilford M. Hemstad

for Bennie C. Keel
Chief, Interagency Archeological
Services-Atlanta

cc:
Jack E. Stark
North Atlantic Regional Office

United States Department of the Interior

NATIONAL PARK SERVICE

NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

IN REPLY REFER TO:
L-7619-NAR-(PE)

April 18, 1977

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in response to your public notices 76-101-6 (Cayuga Lake) and 76-484-29 (Lake Ontario) on the alternative sites for the New York State Electric and Gas Corporation's proposed power plant cooling systems.

We note your advisory to the National Park Service that your applicant has initiated historical and archeological surveys and wish to recall the March 22 commentary to your Paul Leuchner from our Chief, Interagency Archeological Services, Atlanta on a report of such surveys to that date. Until such time as we can review improved reports, particularly on the Lake Ontario (Somerset alternative) site, we sustain the comments in the March 22 letter (copy enclosed).

Further, we take this opportunity to mention that significant natural as well as cultural resources should be addressed and adequately covered in your environmental impact statement.

Sincerely yours,

Jack E. Stark

Jack E. Stark
Regional Director

Enclosure

NEW YORK STATE ELECTRIC & GAS CORPORATION

BINGHAMTON, NEW YORK 13902

May 5, 1977

NYMISC - 469
File Nos: 1.15.1
9.5.1

Colonel Daniel Ludwig
District Engineer
Buffalo District, Corps of
Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

SUBJECT: New York State Electric & Gas Corp.
Cayuga Station Project
Cultural Resources Survey

New York State Electric & Gas Corporation is in receipt of your letter of 25 April, 1977 regarding the cultural resources survey of the proposed Cayuga and Somerset alternate sites. The letter has been forwarded to Dr. Peter P. Pratt in order that a response may be drafted. I expect to be able to forward a response to you in two to three weeks.

If you have any questions or desire further information, please advise.

Very truly yours,

P. D. MacEwan

P. D. MacEwan
Licensing Supervisor

PDM/mp

cc: J. J. Case
P. Leuchner
R. Schutt
M. F. McDonald

aqm

mld
7 June 1977

NCBCO-S

David Riley, Assistant Regional Director
U.S. Fish and Wildlife Service
One Gateway Center
Newton Center, MA 02158

Dear Mr. Riley:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the New York State Electric & Gas Corporation (NYSE&G) to construct an 850 megawatt coal-fired steam electric generating station on Cayuga Lake in the Town of Lansing, Tompkins County, New York or alternatively on Lake Ontario in the Town of Somerset, Niagara County, NY.

As part of the data input for the EIS, we have requested NYSE&G to prepare an environmental assessment of the project. This assessment was recently completed and two copies are enclosed for your technical review and evaluation. The assessment addresses the construction of the power plant on Cayuga Lake. An assessment of the Somerset alternative site should be available on or about 22 June 1977. We will send copies of the Somerset assessment to your office as soon as it is made available.

In order to insure the preparation of a complete and accurate EIS it is essential that all pertinent issues and concerns be identified prior to the release of this statement for public review. Therefore, I am requesting that you initiate a technical review of the information contained in this document to determine its acceptability as the basic input for the Environmental Impact Statement.

Please do not be misled by the title of the document which indicates that the subject report is a draft assessment. The report is actually the applicant's final environmental data report to the Corps. It represents the formal positions of the New York State Electric & Gas Corporation.

NCBCO-S
David Riley, Assistant Regional Director

We have forwarded twelve copies of the subject environmental report to the U.S. Department of the Interior, Office of the Secretary, Office of Environmental Project Review, Washington, DC, along with a request for technical review. We also advised the Department that we would transmit two copies to your office, and one copy to the Cortland, NY, office, U.S. Fish and Wildlife Service, in order to expedite the review process.

Please forward your comments to Mr. Arthur K. Marks or Mr. Paul G. Leuchner, of my Regulatory Functions Branch, on or before 22 July 1977, so that they may be incorporated into the EIS.

If you have any questions, please contact Mr. Marks or Mr. Leuchner by calling A/C 716, 876-5454, extensions 2329 and 2321 respectively.

Sincerely yours,

Incl
as stated

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

CF: NCBCO-S

Mr. William Knapp
U.S. Fish and Wildlife Service
100 Grange Place, Room 202
Cortland, NY 13045

Peter D. MacEwan, Licensing Supervisor
New York State Electric & Gas Corporation
4500 Vestal Parkway East
Binghamton, NY 13902

14 June 77
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NCBCO-S

7 June 1977

Mr. Bruce Blanchard, Chief
Office of Environmental Project Review
ATTN: Lillian Stone
Office of the Secretary
U.S. Department of the Interior
Room 4350
Main Interior Building
18th and C Streets NW
Washington, DC 20240

Dear Mr. Blanchard:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the New York State Electric & Gas Corporation (NYSE&G) to construct an 850 megawatt coal-fired steam electric generating station on Cayuga Lake in the Town of Lansing, Tompkins County, New York or alternatively on Lake Ontario in the Town of Somerset, Niagara County, NY.

As part of the data input for the EIS, we have requested NYSE&G to prepare an environmental assessment of the project. This assessment was recently completed and twelve copies are enclosed for your technical review and evaluation. The assessment addresses the construction of the power plant on Cayuga Lake. An assessment of the Somerset alternative site should be available on or about 22 June 1977. We will send copies of the Somerset assessment to your office as soon as it is made available.

In order to insure the preparation of a complete and accurate EIS it is essential that all pertinent issues and concerns be identified prior to the release of this statement for public review. Therefore, I am requesting that you initiate a technical review of the information contained in this document to determine its acceptability as the basic input for the Environmental Impact Statement.

Please do not be misled by the title of the document which indicates that the subject report is a draft assessment. The report is actually the applicant's final environmental data report to the Corps. It represents the formal positions of the New York State Electric & Gas Corporation.

NCBCO-S
Mr. Bruce Blanchard, Chief

We have already forwarded two copies of the environmental report to the U.S. Fish and Wildlife Service Regional Office in Newton Corner, MA, and one copy to the Cortland, NY, office of the same agency to expedite the review process.

Please forward your comments to Mr. Arthur K. Marks or Mr. Paul G. Leuchner, of my Regulatory Functions Branch, on or before 22 July 1977, so that they may be incorporated into the EIS.

If you have any questions, please contact Mr. Marks or Mr. Leuchner by calling A/C 716, 876-5454, extensions 2329 and 2321 respectively.

Sincerely yours,

Incl
as stated

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

CF: NCBCO-S
Copy with no inclosure sent to:
Peter D. MacEwan, Licensing Supervisor
New York State Electric & Gas Corporation
4500 Vestal Parkway East
Binghamton, NY 13902

Mr. William Knapp
U.S. Fish and Wildlife Service
100 Grange Place, Room 202
Cortland, NY 13045

1400 Hrs 7 June 77
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NCBCO-S

7 June 1977

Arthur Rheingold, Esq.
Staff Counsel
NYS Public Service Commission
Agency Building Three
Empire State Plaza
Albany, NY 12223

Dear Mr. Rheingold:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the New York State Electric & Gas Corporation (NYSE&G) to construct an 850 Megawatt coal-fired steam electric generating station on Cayuga Lake in the Town of Lansing, Tompkins County, New York, or alternatively on Lake Ontario in the Town of Somerset, Niagara County, NY.

As part of the data input for the EIS, we have requested NYSE&G to prepare an environmental assessment of the project. This assessment was recently completed and four copies are enclosed for your technical review and evaluation. The assessment addresses the construction of the power plant on Cayuga Lake. We anticipate receipt of the Somerset alternative site assessment on or about 22 June 1977. When the Somerset site report is available, we will forward copies to your office.

Please forward your comments to Mr. Arthur K. Marks or Mr. Paul G. Leuchner, of my Regulatory Functions Branch, on or before 22 July 1977, so that they may be incorporated into the EIS.

If you have any questions, please contact Mr. Marks or Mr. Leuchner by calling A/C 716, 876-5454, extension 2329 and 2321 respectively.

Sincerely yours,

Incl
as stated

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

CF: NCBCO-S

Carbons of this letter were sent to:
1. Hon. Stewart C. Boschwitz
2. Mr. Gerry Weber
3. Mr. Robert Vessels
4. Michael Flynn, Staff Counsel

All of the above are Public Service Commission reps. at same address as Rheingold.

Also carbon to:

Peter D. MacEwan, Licensing Supervisor
New York State Electric & Gas Corporation
4500 Vestal Parkway East
Binghamton, New York 13902

← mailed by Reg. Funct. Pr.

1530 hrs. 7 June 77
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NCBCO-S

7 June 1977

Dr. Barbara Metzger
Chief, Environmental Impact Branch
Region II, U.S. EPA
26 Federal Plaza
New York, NY 10007
ATTN: Mr. Charles ZaFonte

Dear Dr. Metzger:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the New York State Electric & Gas Corporation (NYSE&G) to construct an 850 megawatt coal-fired steam electric generating station on Cayuga Lake in the Town of Lansing, Tompkins County, New York or alternatively on Lake Ontario in the Town of Somerset, Niagara County, NY.

As part of the data input for the EIS, we have requested NYSE&G to prepare an environmental assessment of the project. This assessment was recently completed and four copies are enclosed for your technical review and evaluation. The assessment addresses the construction of the power plant on Cayuga Lake. An assessment of the Somerset alternative site should be available on or about 22 June 1977. We will send copies of the Somerset assessment to your office as soon as it is made available.

In order to insure the preparation of a complete and accurate EIS it is essential that all pertinent issues and concerns be identified prior to the release of this statement for public review. Therefore, I am requesting that you initiate a technical review of the information contained in this document to determine its acceptability as the basic input for the Environmental Impact Statement.

Please do not be misled by the title of the document which indicates that the subject report is a draft assessment. The report is actually the applicant's final environmental data report to the Corps. It represents the formal positions of the New York State Electric & Gas Corporation.

NCBCO-S
Dr. Barbara Metzger

Please forward your comments to Mr. Arthur K. Marks or Mr. Paul G. Leuchner, of my Regulatory Functions Branch, on or before 22 July 1977, so that they may be incorporated into the EIS.

If you have any questions, please contact Mr. Marks or Mr. Leuchner by calling A/C 716, 876-5454, extensions 2329 and 2321 respectively.

Sincerely yours,

Incl n/E
as stated

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

CF: NCBCO-S

1400 Hrs 7 June 77
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Leuchner
Gaume
Blair
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DE

Copy with no inclosure to:
Peter D. MacEwan, Licensing Supervisor
New York State Electric & Gas Corporation
4500 Vestal Parkway East
Binghamton, NY 13902

Mailed by Reg. Func. Br. 8 June 77

Copy with inclosure to:

Joseph W. Hudek, Environmental Scientist
Region II
U.S. EPA
28 Federal Plaza
New York, NY 13902

Mailed 9 June 77 mail room

June 24, 1977

RECEIVED
JUN 29 1977
CAYUGA PROJECT

Mr. Craig D. MacKay
United Engineers and Constructors, Inc.
100 Summer Street
Boston, Mass.

Re: Gordon C. DeAngelo's qualifications as consultant in archaeology

Dear Craig:

Gordon C. DeAngelo by profession is a licensed landscape architect with the Department of Transportation, Syracuse, New York. In that position, Mr. DeAngelo does Cultural Resource Management surveys for the Department of Transportation. Mr. DeAngelo is also the Secretary-Treasurer of the Council for Northeast Historical Archaeology. He is the founder of the William Beauchamp Chapter of the New York State Archaeological Association. He is also affiliated with the Society for Historical Archaeology, the Pennsylvania Archaeological Society and the Society of Post Mediaeval Archaeology.

Mr. DeAngelo has worked on many projects for professional archaeologists such as former New York State Archaeologist Dr. William A. Ritchie, present State Archaeologist Dr. Robert E. Funk, Memorial University Archaeologist Dr. James Tuck and for us. He has also done consulting work in archaeology for the National Parks Service at Fort Stanwix and for the New York State Police.

Cordially,

Peter P. Pratt

PPP/dnw

Peter P. Pratt, Ph.D.
PRATT & PRATT ARCHAEOLOGICAL CONSULTANTS
1220 Euclid Avenue
Syracuse, New York 13210
(315) 472-5982

E-15

Response Req'd? ___
Response by ___
[redacted]
W.M. Brocklebank
C.M. Venato
C.D. MacKay
M.J. Simeone
D.E. Carmichael
R.E. Fisher
V.R. Deyo
R.F. Hanson
J.D. Cox
J.E. Pinkerton
M.F. McDonald
Environmental (6)
W.F. Tucker
S.L. Lueder
Remarks/Comments:

Microfilm File
Serial File
Cayuga File (2)
Ltr #

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-ER-77/622
Mail Stop 760

AUG 1 1977

Mr. Paul G. Leuchner
Regulatory Functions Branch
U.S. Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Leuchner:

We have reviewed the draft environmental assessment of the Somerset site for an electric generating station and offer the following comments to assist in preparation of an environmental statement.

We suggest that inclusion of more specific depth-to-water information for the various aquifers and water table contours for the shallow aquifer is needed to facilitate evaluation of the impacts of construction and operation. The water levels plotted on cross sections (fig. 2-18 through 2-20) are suggestive but difficult to use. If any dewatering will be necessary, evaluation of effects should include not only changes in water levels but also the possibilities for inducing upward or lateral migration of saline water. Either the environmental statement or a supplement should evaluate more adequately the impacts of final ash disposal once a site is chosen, and effects of infiltration from the coal-runoff settling basins should also be assessed.

Thank you for the opportunity to provide this assistance.

Sincerely yours,

Henry W. Coulter

Acting Director

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

NEW YORK STATE ELECTRIC & GAS CORPORATION

BINGHAMTON, NEW YORK 13902

August 3, 1977

NYMISC - 508
File Nos: 1.15.1
9.5.1

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Attention: Paul Leuchner, Regulatory Functions Branch

Dear Colonel Ludwig:

SUBJECT: New York State Electric & Gas Corporation
Cayuga Station Project
National Park Service letter of March 22, 1977

The subject letter has been reviewed by Dr. Peter P. Pratt, author of the cultural resources survey of the Cayuga and Somerset Sites. The attached letter from Dr. Pratt discussing the qualifications of Mr. Gordon C. DeAngelo addresses the concern of the National Park Service.

If you believe further information is required, please advise.

Very truly yours,

P. D. MacEwan
Licensing Supervisor

PDM:mgs
Attachment

cc: R. B. Brocklebank
J. J. Case
M. F. McDonald
R. Schutt

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

22 AUG 1977

Mr. Arthur K. Marks
Regulatory Functions Branch
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Marks:

We have reviewed the two environmental assessments (EA) prepared by New York State Electric and Gas Corporation (NYSE&G) for its proposal to construct an 850 MW coal-fired steam electric generating station on Cayuga Lake in the Town of Lansing, Tompkins County, or on Lake Ontario in the Town of Somerset, Niagara County, New York. The following comments are offered for your consideration in drafting an environmental impact statement (EIS) in connection with this proposal.

For the following reasons, the greater part of this letter addresses only the aquatic impacts of a power plant located at either proposed site. Amendments to the Clean Air Act have just this week been enacted. Comments on the proposal's air quality impacts will, therefore, be deferred until the effect of the amendments on the project can be determined. Although the noise impacts of construction and operation of the project appear acceptable, the EIS should summarize noise measurement procedures and relate projected noise levels to specific noise-sensitive receptors. Solid waste impacts cannot be evaluated without information contained in the Report on Ash Disposal referenced in the EAs.The discussion regarding landfill cover disposal of coal ash should recognize that a detailed analysis of the ash make-up and of the specific landfill site is necessary before this option is chosen. Meanwhile, alternate uses or recovery methods should be explored.

The NYSE&G is a good deal more confident of the adequacy of its aquatic data than appears warranted, based on information contained in the EAs. Statements (p. 4-36 of Cayuga; p. 4-31 of Somerset) that once-through cooling at these sites will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the lakes are flatly presented without reasonable support. Low total numbers of organisms collected by a very limited number of unit efforts over a relatively short period of time cannot adequately characterize large populations with any reasonable degree of statistical reliability.

For instance, Cayuga fish sampling occurred from July 1974 through July 1975. Yet actual seining was performed only in July 1974, and June through August 1975. For Somerset, although the gill net effort appears reasonable for a one-year program, seine and trawl efforts are inadequate, e.g. only 36 seine hauls from May through October 1974 with only 2 hauls in September. Necessary information on ichthyoplankton sampling is missing: number of tows, diurnal sampling, vertically stratified tows.

The numbers of organisms caught also seem unreasonably low. For instance, the total number of fish caught at Cayuga by seine in August 1975 was 6! Ichthyoplanton sampling at Cayuga in the same month yielded 3 larvae. It is recommended that NYSE&G be requested to perform a professional survey of the lakes' resources. We understand that Dr. Eiper, formerly of Cornell University, has done enough work in this area to indicate that the aquatic data in the EAs are seriously inadequate. In addition, we do not understand why impingement estimates at Cayuga are "generated" from Lake Ontario data when one-half mile south of the Cayuga site is Milliken station, an operating power plant much more applicable for sampling.

Estimates of entrainment losses of ichthyoplankton at Cayuga are the lowest we have ever encountered. The annual loss of larvae of all species is estimated at 2.6×10^6. Given a water flow of 528 cfs, we calculate a lake density of 0.005 larvae/m^3 or 1 larva per 200 cubic meters of lake water! Page 4-52 indicates that not all ichthyoplankton data were used; the reasons and analyses of variance should be included.

The EAs state that although the proposed plants would violate New York's thermal criterion, the criterion is more stringent than necessary to assure protection of a balanced population. Since the aquatic data are clearly inadequate to characterize the sites, this cannot at present be demonstrated. In addition, there would be significant interaction between Cayuga and the Milliken power plant. In Figure 4-17, for example, the 5°F isotherm from Milliken hugs the shore for about 2000 feet, the 2°F isotherm from Cayuga extends about 1 mile into the lake, and the combined 0.5°F isotherm extends off the graph. It should also be noted that the thermal plume plots only consider north-south and south-north flows. Since the wind rose in Figure 2-20 shows winds from NNW to SSW during some 60 percent of the time, consideration should be given to the shoreward propensity of the plume. In this regard, shore-hugging plumes can violate state criteria through interference with spawning/nursery areas and through blockage of alongshore migration routes.

The structure of the EAs could stand improvement. The very frequent references to the Article VIII application make any review difficult. We recommend that information sources be summarized and relevant details, such as important assumptions, be included.

Attached are some comments regarding specific sections of the EAs. I hope to send you our air analysis within one month.

Thank you for the opportunity to comment on these EAs. Please contact me at 8-264-8556 if EPA can assist you further on this project or future projects in Region II.

Sincerely yours,

Joanne M. Brennan
for

Charles W. Zafonte
EIS Review Coordinator
Environmental Impacts Branch

Attachment

ATTACHMENT

Cayuga EA (Somerset EA sections are noted in parentheses)

Section 2.368 - Since Cyclops bicuspidatus is not a macrozooplankton, the latter remain unaddressed.

Section 2.369 - Transect results for zooplankton are requested.

Section 4.163 - Please identify the "...operating power generation facilities at locations with similar aquatic communities...", and the criteria used to determine the usefulness of the data.

Section 4.164 - Please explain how "...Relevant..." was determined and what statistical analyses were used.

The mentioned EPA document should be referenced. It should be noted that more recent EPA documents state that intake velocity and impingement are not necessarily related.

Section 4.165 - Besides intake velocity, impingement is also affected by fish size, abundance, etc.

It is difficult to believe that no entrainment of fish will occur; fish eggs and larvae should be considered.

Section 4.173 (Sections 4.148 and 4.151) - The debate on whether entrainment losses are mechanically or thermally induced has not been resolved. Most probably, there is a site-specific synergism of factors.

Section 4.176 (Section 4.153) - Although some fish do avoid high currents, many fish actively seek such areas. Flow and species should be specified.

Section 4.191 - Please specify the relation of the 1972 Spigarelli study (reference #49) to Cayuga, e.g. species of fish.

Section 4.192 (Section 4.153) - The statement that a fish is protected from high temperatures because it prefers low temperatures is illogical unless active avoidance is demonstrated by a given species at given current speeds.

Section 4.193 (Section 4.153) - Fish species should be stated.

Section 4.195 - Reference #58 is presumably #57.

Section 4.198 (Section 4.192) - Please estimate the extent of the dredging area and evaluate the impact of dredging on fish species. Seasonal dredging limitations should be considered.

Section 4.200 - All three assumptions are very questionable.

Section 4.243 - Spoil sites should be identified and impacts assessed.

Section 4.306 - Opinion should be substantiated.

Section 5.13 (Section 4.164) - What are the conditions of surrounding benthic flora and fauna that will be critical for recolonization?

Section 6 - Alternatives to the plant design and rationales for their rejection are not adequately described.

(Section 4.155) - This discussion is very unclear. Instead of this general discussion, the EA should evaluate the specific fisheries impacts that can be expected.

(Section 4.158) - Are these "available data" the same as those cited on page 4-38? Are the "similar zooplankters" those referred to on page 4-38?

(Section 4.160) - A conclusion that there would be no impact on the entire zooplankton population cannot be drawn from one study of two zooplanton species.

(Section 4.162) - Insert "directly" between "be" and affected.

Is Gammarus spp always benthic? What part of the benthic community has vertical migrations and, therefore, can be impacted by intakes and discharges?

(Section 4.182) - What would be the ecological impacts of enhanced reproduction during winter months due to thermal discharges?

(Section 4.187) - Are all fish eggs in L. Ontario demersal? Please support the statement that a demersal egg found in the water column is ecologically dead.

The impact of ichthyoplankton changes is more complex than recruitment to the fishery. Many life stage niches and their function in the ecological web may be affected. Please clarify this overstatement.

mld

NCBCO-S Re: No. 76-101-6 & 76-484-29 24 August 1977
Project: Proposed Cayuga Steam Electric Generating Station

Mr. Dave Clark
National Park Service
North Atlantic Region
150 Causeway Street
Boston, MA 02114

Dear Mr. Clark:

Enclosed is a copy of a letter we received from the New York State Electric & Gas Corporation in response to your letter of 22 March 1977.

Please review this correspondence and furnish your comments to our office as soon as possible.

Sincerely yours,

CF: NCBCO-S

THOMAS R. BRAUN
LTC, Corps of Engineers
Acting District Engineer

1445 hrs 23 Aug 77
Marks
Lenchner
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Hair
Acting DE

Incl.
NYSERG letter dated

United States Department of the Interior

NATIONAL PARK SERVICE

NORTH ATLANTIC REGION
15 STATE STREET
BOSTON, MASSACHUSETTS 02109

IN REPLY REFER TO:
L-7619-NAR-(PE)
ER-77/578 & 622

September 2, 1977

Lieutenant Colonel Thomas R. Braun
Acting District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Braun:

This responds to your letter of 24 August concerning the qualifications of Gordon C. DeAngelo who was involved in the cultural resources reconnaissance survey for the Cayuga and Somerset alternative sites for an electric power generating station proposed by your permit applicant, New York State Gas and Electric Corporation.

I have checked with our Interagency Archeological Services Office in Atlanta (which originated our letter of March 22), and we are pleased to report the background statement supplied by Dr. Peter Pratt to be acceptable in this instance.

We appreciate your follow-through in this matter and are always glad to provide technical assistance.

Sincerely yours,

David E. Clark
Chief, Environmental Compliance

NEW YORK STATE PARKS & RECREATION Agency Building 1 Empire State Plaza Albany, New York 12238 Information 518/474-0456
Otis Lehmann Commissioner

3176

November 15, 1977

Mr. Paul Leuchner
Regulatory Functions Branch
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Leuchner:

Re: 850mw Coal Fired Steam Electric Power Generating Station
Cayuga Lake, Town of Lansing, Tompkins County
OR Lake Ontario, Town of Somerset, Niagara County

The State Historic Preservation Officer (SHPO) has reviewed the cultural resources survey report (Cultural Resources Survey of the Proposed Cayuga Site and Somerset Alternate Site) for the above proposed project in accordance with the Advisory Council on Historic Preservation's "Procedures for the Protection of Historic and Cultural Properties," 36 CFR 800.

Based upon this review, it is the opinion of the SHPO that implementation of the project at the Cayuga site will have no effect upon cultural resources included in or eligible for inclusion in the National Register of Historic Places.

Construction of the proposed facility at the Somerset site will have no effect upon archeological resources. There are several structures at the Somerset location, however, that may meet the criteria for inclusion in the National Register. These include the George Badgley House and the Van Wagoner House. If the Somerset location is chosen, additional information should be provided in order for the SHPO to comment upon the eligibility of these properties for the National Register.

Should you have any questions, please contact the project review staff at 518-474-3176.

Sincerely,

F.L. Rath, Jr.
Deputy Commissioner for
Historic Preservation

LRK:mr

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-484-29 15 February 1978
Applicant: New York State Electric and Gas Corporation

"j"

Dear "j":

We are currently preparing a draft environmental impact statement on a permit application by the New York State Electric and Gas Corporation to construct a cooling water intake and discharge system in Lake Ontario; to place riprap shore protection; and to perform the dredging needed to facilitate the construction of the structures. The work is ancillary to the establishment of a 850 megawatt, coal-fired steam electric generating station which is planned for a 963-acre site at Somerset, Niagara County, New York.

In order to fully assess the relationship between the proposed project and the plans of other agencies, we would appreciate knowing whether or not the subject project will conform or conflict with the objectives and specific terms of existing or proposed land use plans, policies, and controls, if any, that your agency may have reviewed or formulated for the project area. An evaluation of master plans, zoning regulations, plans developed in response to the Clean Air Act and the Federal Water Pollution Control Act Amendments of 1972, or other related land use proposals of your agency, would be helpful in this respect.

A copy of the public notice No. 76-484-29, issued by the Corps of Engineers, Buffalo District, on 13 April 1977, is enclosed for your information.

We would be most pleased if you would reply by 1 March 1978. If additional information is needed, please contact Mr. Arthur K. Marks of my staff. He can be reached by calling A/C, 716, 876-5454, extension 2329.

Sincerely yours,

Incls
as stated

DANIEL D. LUDWIG, PE
Colonel, Corps of Engineers
District Engineer

Federal:

US Housing and Urban Development
Environmental Clearing House
Buffalo Area Office
Grant Building
560 Main Street
Buffalo, NY 14202

Dr. Charles E. Jeffrey
Somerset Town Planning Board
9187 Somerset Drive
Barker, NY 14012

State:

Mr. Marty Cummings
New York Department of Public Services
Agency Building #3
Empire State Plaza
Albany, NY 12223

Mr. James C. O'Shea, Commissioner
State of New York
Executive Department
Office of General Services
Tower Building
Empire State Plaza
Albany, NY 12242

Mr. Hank Williams
Division of State
162 Washington Avenue
Albany, NY 12231

County:

Mr. Walter J. Floss, Jr.
Erie and Niagara Counties
Regional Planning Board
3103 Sheridan Drive
Amherst, NY 14226

Mr. William Mather
Niagara County Economic and
Development Planning Department
County Office Building
59 Park Avenue
Lockport, NY 14094

Local:

Mr. Egbert D. Hamminga
Newfane Town Planning Board
Lockport Street
Olcott, NY 14126

Mr. Daniel Baker
Barker Village Planning Board
Main Street
Barker, NY 14012

HUGH L. CAREY
GOVERNOR

STATE OF NEW YORK
EXECUTIVE DEPARTMENT
OFFICE OF GENERAL SERVICES
TOWER BUILDING
EMPIRE STATE PLAZA
ALBANY, N. Y. 12242

JAMES C. O'SHEA
COMMISSIONER

March 1, 1978

Colonel Daniel D. Ludwig
Department of the Army
Buffalo District Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in reply to your letter of February 15, 1978, concerning the proposed construction by the New York State Electric and Gas Corporation of a 850 megawatt, coal-fired steam electric generating station at Somerset, Niagara County, New York.

The proposed project will not conflict with the objectives and specific terms of existing or proposed land use plans, policies and controls by this office. However, a grant of easement will be required for the underwater land to be occupied by the proposed project which involves shore protection, cooling water intake and a discharge diffuser system.

We appreciate your having contacted us with reference to this proposed project.

Sincerely,

James C. O'Shea

March 1, 1978

Colonel Daniel D. Ludwig
Corps of Engineers
District Engineer
Department of the Army
1776 Niagara Street
Buffalo, NY 14207

Dear Colonel Ludwig:

We appreciate the opportunity to respond to your letter of 15 February regarding the drafting of the environmental impact statement relating to the N.Y.S. Electric and Gas Corporation Lake Ontario proposal.

Our major concern at this time is the preservation of the beauty and usefullness of our lake shoreline. We view the shoreline as one of our most valuable town assets and have indicated such in our Town Comprehensive Plan.

Therefore, we would urge that all possible consideration be given to the establishment of guidelines which will preserve our shoreline in its natural state to the maximum extent possible. We are especially concerned that access to the lake shore be guaranteed for our local residents (and others) for purposes of general recreation and enjoyment. To this end we included in our Master Plan the development of a park as part of the N.Y.S. Electric and Gas Corp. site.

With the continued development of the lake shore and the loss of large blocks of land with valuable shoreline to private individuals and corporations, it becomes increasingly important for us to assure general public access to the Lake.

Regarding the environmental impact of the construction of the N.Y.S. Electric and Gas Corp. plant, we would urge all possible and available methods be utilized during construction periods to minimize any degrading of the adjacent land and/or water areas. Specifically, we would be concerned that minimal disruption of land and water areas might take place so as to not decrease appreciably the general recreational use of adjacent areas. As you know, this area, like other Lake Ontario lake shore areas, is utilized for boating, swimming, fishing, picnicing and related recreational activities.

In particular, the dredging and/or blasting activities associated with the construction of the cooling water system should be carefully monitored. Some attention should also be given to the general environmental impact on the entire township and adjacent areas during the construction stages due to the heavy and constant construction vehicle and associated traffic throughout the area.

THIS PAGE IS BEST QU... ORIG...
FROM COPY FURNISH...

On a more personal note, I would bring your attention especially to the Riprap proposal for shoreline protection. While I do not have the experience nor the expertise of the Corps, as a lake shore resident myself, I seriously question whether the loose boulder approach is sufficient to protect the shoreline. In our experiences in recovering from the 1973 storm, many approaches to shoreline protection have been tried in our area. I am most impressed with the projects which used concrete in conjunction with boulders and others which used large blocks of Albion sandstone as breakwalls.

Whatever the ultimate decision, I would urge special attention and emphasis be placed on the shoreline protection parts of the N.Y.S. Electric and Gas Corp. proposal, since it is central to the long-range success of the circulating water system and in fact the plant itself.

Thank you for this opportunity to comment at this time. We stand prepared to assist in any way possible to preserve the rural nature of our township, to provide recreational facilities for the people of our town, county and State, and to support the development of our area consistent with our long-range planning.

We would appreciate receiving copies of the Environmental Impact Statement when it becomes available.

Sincerely,

Charles E. Jeffrey

Charles E. Jeffrey, Chairman
Town of Somerset Planning Board

CEJ/dmk

cc: William Mather
Niagara County Econ. Dev. and Plan. Dept.

Ted Belling
Niagara County Econ. Dev. and Plan. Dept.

Donald Eick, Clerk
Somerset Town Board

ERIE & NIAGARA COUNTIES 

REGIONAL PLANNING BOARD

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March 7, 1978

Colonel Daniel D. Ludwig, P.E.
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The Erie and Niagara Counties Regional Planning Board has reviewed the Corps request for comments relative to the development of a environmental impact statement (EIS) for construction activities around the proposed Somerset power plant. Our planning division and 208 Water Quality Unit have reviewed the request and put forward the following elements which should be considered during EIS development.

1. Prime viable farmlands as well as an agricultural district are located close to the site. The abovementioned resources should be considered within the impact statement.

2. The cooling water intake and discharge system will impact on fish habitat and wintering waterfowl concentration around the site. This element must be considered by the Corps.

The ENCRPB feels that a review of the completed EIS is essential before this office can fully evaluate the proposed project. Therefore, we wish to request that copies of the completed Environmental Impact Statement be submitted to the Regional Planning Board for our review.

Thank you for accepting our comments and we look forward to hearing from you in the near future.

Very truly yours,

Richard A. Maltby

Richard A. Maltby, AIP
Deputy Director

RAM:TD:ch

NEW YORK STATE ELECTRIC & GAS CORPORATION

BINGHAMTON, NEW YORK 13902

May 25, 1978

NYCOE-670
File Nos. - 1.33C
L5.1

Daniel D. Ludwig
Colonel, Corps of Engineers
District Engineer
1776 Niagara Street
Buffalo, NY 14207

ATTN: Permits Branch

SUBJECT: Cayuga Station Project
Application for Department of the Army Permit (Form 4345)

Dear Colonel Ludwig:

On July 16, 1976, New York State Electric & Gas Corporation filed the subject permit applications for the Cayuga and Somerset Sites. Since that time, the New York State Board on Electric Generation Siting and the Environment has conducted extensive public hearings regarding the Cayuga Station Project. These hearings have resulted in changes to the conceptual design of the facility which have a bearing on the permit applications and the Draft Environmental Impact Statement recently distributed by the Corps of Engineers. Among the more important changes are:

1. Rip-rap will no longer be placed along the shoreline at the Somerset site. Instead, NYSE&G will relocate the intake pump house adjacent to the main facility and will monitor the shoreline erosion. Should it become necessary at some later date to install shoreline protection because of rapid erosion, NYSE&G will take the necessary steps.

2. In lieu of burning low sulfur coal, NYSE&G will install a non-regenerative flue gas desulfurization system. All waste products resulting from this system will be combined with fly ash, stabilized and disposed of on-site in the previously designated ash disposal areas.

NYSE&G is now in the process of revising appropriate drawings and preparing comments for the permit application and the Draft Environmental Impact Statement. These will be forwarded to you as soon as they are available for your consideration and use.

If you have any questions or desire further information, please advise.

Very truly yours,

P. D. MacEwan
Licensing Supervisor

PDM/lh

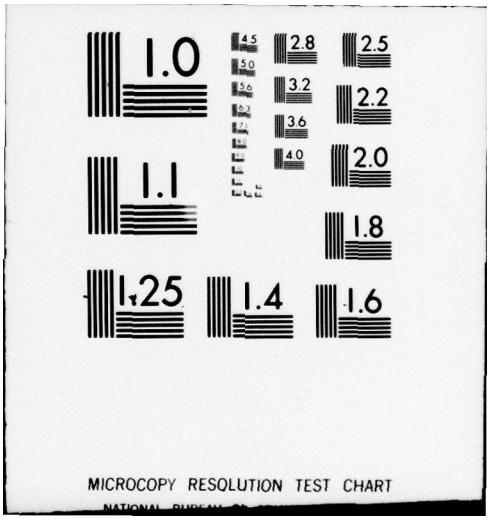
cc: A. Marks
J. J. Case
R. Schutt
W. H. Rowell
A. E. Kintigh

AD-A080 096 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 5/5
FINAL ENVIRONMENTAL IMPACT STATEMENT PERMIT APPLICATION BY NEW --ETC(U)
DEC 78 A K MARKS, P G LEUCHNER, R S ROTHMAN

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DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-484-29
New York State Electric &
Gas Corporation

25 May 1978

Mr. Glenn Loomis
Office of the Secretary
U.S. Department of Agriculture
Washington, DC 20250

Dear Mr. Loomis:

This letter concerns a proposal by the New York State Electric and Gas Corporation to construct an 850 megawatt coal-fired steam electric generating station in Somerset, New York. A draft Environmental Impact Statement, which covers this proposal, is enclosed for your information (Incl 1).

Construction of the proposed power plant would result in the clearing of 104 acres of active farmland. The proposed site contains a total of 539 acres of active agricultural land. In addition to the direct loss of agricultural land, the secondary impact of plant emissions on air quality may also have an adverse impact on agricultural production in the area surrounding the plant site. The proposed site is located on the southern shore of Lake Ontario in Niagara County, New York. Active agricultural land is the predominant land use classification in the region surrounding the site, comprising about 38.1 percent of the total regional acreage (Erie, Orleans, and Niagara counties).

On 30 August 1976 guidelines were issued by the Council on Environmental Quality requiring Federal agencies to assess the impact of their actions on prime and unique farmlands. Prime farmlands are defined as those that are valuable in terms of soil and water conditions. Unique farmlands are those that are valuable from the standpoint of specialty crop production. A copy of this guidance is attached to this letter (Incl 2).

In view of this requirement, I request your assistance in determining whether or not prime or unique farmlands are located within or adjacent to the Somerset site. When making this determination, please indicate the effect the proposed action will have on these resources.

If you have any questions regarding this request, please contact Mr. Arthur Marks of my staff by calling A/C 716, 876-5454, extension 2329.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incls
as stated

Copies sent to:

Roger J. Barber, Commissioner
Department of Agriculture & Markets
State Office Campus
999 Washington Avenue
Albany, NY 12235

Mr. Robert L. Hilliard
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
U.S. Courthouse and Federal Building
100 S. Clinton Street, Room 771
Syracuse, NY 13210

Mr. Walter J. Floss, Jr.
Erie and Niagara Counties Regional
Planning Board
3103 Sheridan Drive
Amherst, NY 14226

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U. S. Courthouse and Federal Building, Syracuse, New York 13260

June 2, 1978

Colonel Daniel D. Ludwig, P. E.
District Engineer
Buffalo Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The enclosed data is furnished in response to your request for assistance in determining whether prime or unique farmlands are located in or around the Proposed Cayuga Power Station in Somerset, Niagara County, New York.

The following are enclosed with some explanatory remarks where appropriate:

(1) Niagara County, New York Soil Survey. This report includes photo based maps which show soil survey data for the entire county. You can locate the project area on the appropriate map.

(2) A list of Niagara County, New York, Prime Farmland Mapping Units. These units are the key to the soil survey (Item 1). From the map and the list you can determine the Prime Farmlands.

(3) A list of the Niagara County, New York, Farmland of Statewide Importance - Mapping Units. The State of New York is concerned about project impacts on such farmlands. Again, these units are the key to the Niagara County Soil Survey Report.

(4) Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables. It would also include vineyards and orchards.

(4) (Continued)

Specific characteristics of unique farmland.

(a) Is used for a specific high-value food or fiber crop.

(b) Has a moisture supply that is adequate for the specific crop. The supply is from stored moisture, precipitation, or a developed irrigation system.

(c) Combines favorable factors of soil quality, growing season, temperature, humidity, air drainage, elevation, aspect, or other conditions, such as nearness to market, that favor the growth of a specific food or fiber crop.

We appreciate your interest and concern for the prime and unique farmlands of the state.

Sincerely,

Robert L. Hilliard

Robert L. Hilliard
State Conservationist

Enclosures
Niagara County Soil Survey
Prime Farmland List
Farmland of Statewide Importance List

cc: Herbert J. Lyford
Gary S. Domian

ERIE & NIAGARA COUNTIES  **REGIONAL PLANNING BOARD**

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Walter J. Moss, Jr.
VICE CHAIRMAN
Joseph N. Williams
SECRETARY

June 12, 1978

Colonel Daniel D. Ludwig, P.E.
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Thank you for requesting our assistance in identifying prime and unique farmlands which are located close to the proposed Somerset Power Plant. As you know, our office is involved in developing the Erie and Niagara Counties Coastal Zone Management (CZM) Program. During the second year of our work activities, we mapped agricultural districts and farm areas with high economic viability. The map and legend which pertain to the Somerset area are attached for your use. Please note that the latter two categories were obtained from a report prepared by the New York State Office of Planning Coordination in 1969 entitled The Nature and Distribution of Farming in New York State. The information was correlated with the Existing Land Use Inventory Map (1976) compiled by the ENCRPB 208 Water Quality staff. Those areas of high economic viability which were developed for non-agricultural uses and thus preclude farming, were eliminated.

Unfortunately, the farm categories which were mapped for the CZM program do not correspond with the prime and unique farmlands categories as defined by the U.S. Council on Environmental Quality. It is suggested that the Corps contact appropriate U.S. Soil Conservation Service Offices in Niagara and Orleans Counties in order to receive the requested information. It is my understanding that such information has not been mapped by the U.S. Department of Agriculture.

In regard to the power plant's impact on the agricultural areas in Niagara County, various elements need to be analyzed by the Corps during their EIS process. A prominent impact which could arise involves increased land development pressure around the power plant and the subsequent loss of valuable farmlands. In addition, strong safeguards should be enforced during the construction period to reduce the loss of active farm areas. The air quality impact due to sulfur dioxide emissions are obvious and must be addressed during the EIS process.

NORTHTOWN PLAZA, 3103 SHERIDAN DR., AMHERST, NEW YORK 14226 • PHONE ERIE COUNTY (716) 837-2035 NIAGARA COUNTY (716) 625-3114

HELP SAVE OUR ENVIRONMENT — USE RECYCLED PAPER

It is hoped that the above information has proven helpful and we would again encourage the Corps to contact the appropriate U.S. Soil Conservation Service Offices in order to obtain the information regarding prime and unique farmlands.

Very truly yours,

Richard A. Maltby
Deputy Director

RAM:TJD:ms

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S

21 July 1978

Mr. Paul Hamilton
Field Supervisor
U.S. Fish and Wildlife Service
100 Grange Place
Cortland, NY 13045

Dear Mr. Hamilton:

This letter concerns the comments of the U.S. Department of the Interior on our Draft Environmental Impact Statement for the proposed New York State Electric and Gas Corporation electric generating station at Somerset, New York. The letter of comment dated 6 July 1978 and designated ER 78/401 presents the concerns of the U.S. Fish and Wildlife Service and other Department agencies. A copy of this letter is provided as Inclosure One.

On 14 July 1978, my staff contacted Dr. Alfred Eipper of your regional office in Boston by telephone to determine the origin of the subject comments. My staff was informed that comments pertaining to fish and wildlife resources were prepared by your office. Subsequently, a meeting was held on 18 July 1978 at the Buffalo District office with Ms. Lynn Lewis of your staff. The meeting was held to discuss our need for clarification of the issues contained in the 6 July 1978 letter of comment and to determine the specific information which your staff believes is necessary to satisfy your concerns.

Inclosure Two is a copy of the minutes of the 18 July 1978 meeting with Lynn Lewis of your staff. The minutes discuss the information which can be included in the Final EIS to address your concerns. I am requesting that you provide me with a written response within 10 days indicating whether the incorporation in the Final EIS of the information discussed at the 18 July 1978 meeting will satisfy your concerns. I have furnished a copy of this letter along with the meeting minutes to the U.S. Department of the Interior in Washington, DC and to the Regional Administrator of the U.S. Environmental Protection Agency, Region II.

NCBCO-S
Mr. Paul Hamilton

I consider this an urgent matter and would appreciate your cooperation in expeditiously resolving this situation.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incl
as stated

COPY FURNISHED:
1. Mr. Bruce Blanchard
   U.S. Dept. of the
   Interior - Washington, DC
2. Dr. Alfred Eipper
   USF&WS - Boston
3. Regional Administrator
   U.S. EPA - Region II

NCBED-S 21 July 1978

Bruce Blanchard, Chief
Office of Environmental Projects Review
ATTN: Ms. Lillian Stone
Office of the Secretary
U.S. Department of the Interior
Room 4350
Main Interior Building
18th & C Street, NW
Washington, DC 20240

Dear Mr. Blanchard:

This letter concerns the comments of the U.S. Department of the Interior on our Draft Environmental Impact Statement for the proposed New York State Electric and Gas Corporation electric generating station at Somerset, New York. This letter of comment dated 6 July 1978 and designated ER 78/401 presents the concerns of the U.S. Fish and Wildlife Service and other Department agencies.

On 14 July 1978, my staff contacted Dr. Alfred Eipper of the U.S. Fish and Wildlife Service regional office in Boston by telephone to determine the origin of the subject comments. My staff was informed that comments pertaining to fish and wildlife resources were originally prepared by the Cortland Field Office.

Subsequently, a meeting was held on 18 July 1978 at the Buffalo District office with Ms. Lynn Lewis of the Cortland Field Office staff. The meeting was held to discuss our need for clarification of the issues contained in the 6 July 1978 letter of comment and to determine the specific information which the Fish and Wildlife Service believes is necessary to satisfy their concerns.

A vast amount of appropriate site specific and regional data on fish and wildlife resources has been developed and has been thoroughly analyzed by the Corps of Engineers, the U.S. Environmental Protection Agency, the New York State Public Service Commission, and the New York State Department of Environmental Conservation. The independent analyses of these regulatory agencies included a thorough assessment of all alternatives to the proposed project. In accordance with evaluations performed under Sections 316(a) and 316(b) of the Federal Water

NCBCO-S
Mr. Bruce Blanchard

Pollution Control Act Amendments of 1972, the Corps of Engineers and the regulatory agencies mentioned above have concluded that once-through cooling is acceptable for the proposed Somerset Cayuga Station. The findings of the U.S. EPA are enclosed. Additionally, the U.S. Fish and Wildlife Service participated in the initial meetings pertaining to 316(a) and (b) demonstrations for the proposed facility. I, therefore, believe that we have more than sufficient information to answer the concerns of the Fish and Wildlife Service. However, the letter of comment dated 6 July 1978 states on page one that the Draft EIS is inadequate, based on inappropriate and insufficient data, and does not adequately assess alternatives. The text of this letter does not indicate the specific information required to eliminate these inadequacies and it is, therefore, difficult to respond to the concerns. To include all the information which has been generated to date would be beyond the scope of an Environmental Impact Statement.

I have, therefore, transmitted a copy of the 18 July 1978 meeting minutes to the Cortland Field Office, U.S. Fish and Wildlife Service along with a request that they provide me with a written response indicating whether the information discussed at the meeting would satisfy their concerns. This procedure is being followed in accordance with your instructions of 20 July 1978. A copy of the cover letter and meeting minutes is enclosed for your information.

I consider this an urgent matter and would appreciate your cooperation in expeditiously resolving this situation.

Sincerely yours,

Glatzel 7 Sep 31 Jul 78

Leuchner 27 Jul 78

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Hair

~~Counsel~~

DDE

DE

Incls
as stated

COPY FURNISHED:
1. Regional Administrator
   USEPA, Region II
2. Dr. Alfred Eipper
   USF&WS - Boston
3. Paul Hamilton
   USF&WS - Cortland
4. Lynn Lewis
   USF&WS - Cortland

CF: NCBCO-S

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
100 Grange Place
Room 202
Cortland, New York 13045

August 2, 1978

District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Sir:

This is in response to your letter of 21 July 1978 concerning the comments of the U.S. Department of the Interior on the Draft Environmental Impact Statement (DEIS) for the proposed New York State Electric and Gas Corporation electric generating station at Somerset, New York.

We have reviewed the minutes of the 18 July 1978 meeting between representatives of the U.S. Fish and Wildlife Service and the Buffalo District, Army Corps of Engineers and for the most part agree with their content.

Our original comments which were submitted to the Department of the Interior were organized to include general comments, specific comments which expanded upon the general comments, and a summary statement. In some cases our general comments remained in the official Interior comments, while the specific comments to which they referred did not. This may have resulted in the need for the clarification of some comments submitted by the Fish and Wildlife Service.

We originally felt that data collected at the Somerset site for only one year represented an inadequate data base. This is purely a biological judgment on our part, due primarily to the magnitude of the project. However, we can present no firm reason as to why the year in which data was collected for the Somerset project may not be normal; we know of no unusual biological or meterological occurrences, hence this specific comment was deleted in the final Interior comments. Addition of any further data, however, would add to the quality of the Environmental Impact Statement (FEIS), but since one year of fisheries data is all that exist, its addition will suffice unless the applicant is willing to conduct further aquatic and terrestrial studies.

As explained in the minutes, inappropriate data came from extrapolation of impingement data from another portion of Lake Ontario to the Somerset site. There is no reason to assume that fish populations within the Lake are homogeneous. As indicated in the minutes, work is currently being done by the New York State Department of Environmental Conservation at the Cape Vincent Station which supports this position. This information has been put into the written record as testimony at the Sterling Power Plant hearing.

We have no additional comments on ash and dredge spoil disposal, other than to point out that if marshy areas do not exist in the proposed site then they should not have been mentioned in the general site description.

In regards to endangered species, there was no indication in the DEIS that an in-depth study had been carried out or that the sampling program had been specifically designed to determine the status of rare and endangered species. We cannot second guess the DEIS authors and assume that adequate investigations were carried out. Clarification, as indicated in the minutes, is needed.

Regarding alternatives to once through cooling systems, sufficient detailed information should be included in the DEIS to allow the reader to evaluate the case for once through cooling versus cooling towers or other alternative cooling methods. As indicated in the minutes, the decision-making process by which once through cooling was selected over cooling towers should be presented.

It is our hope that through our meeting and these additional written comments that our position has been sufficiently clarified.

Sincerely yours,

Paul P. Hamilton

Paul P. Hamilton
Field Supervisor

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S

2 August 1978

William C. Hennessy, Commissioner
New York State Department of Transportation
1220 Washington Avenue
Albany, NY 12232

Dear Mr. Hennessy:

This letter concerns our Draft Environmental Impact Statement entitled, "Permit Application by New York State Electric and Gas Corporation Proposed Cayuga Station, Somerset, New York." A copy of this document is enclosed.

Paragraphs 2.106 and 3.004 of this document indicate that the power plant may conflict with the proposed Lake Ontario State Parkway. The present alignment of the proposed parkway passes directly through the site as shown in Figure 2-7. The applicant and the Erie and Niagara Counties Regional Planning Board believe that the parkway can be routed around the site to resolve this conflict.

It is important that I obtain the position of the New York State Department of Transportation on this issue. Please provide your comments concerning the possible existence of a conflict and the feasibility of the proposed solution. I would greatly appreciate a reply within ten (10) working days of receipt of this letter.

If you have any questions concerning this mattter, please contact Mr. Thomas Glatzel of my staff by calling A/C 716, 876-5454, extension 2307.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incl
as stated

NCBCO-S

7 August 1978

Regional Administrator
U.S. EPA, Region II
26 Federal Plaza
New York, NY 10017

Dear Sir:

On 21 July 1978 I requested clarification of comments from the U.S. Fish and Wildlife Service on our Draft Environmental Impact Statement entitled, "New York State Electric and Gas Corporation, Proposed Cayuga Station, Somerset, New York." This request asked for concurrence with the minutes of a meeting held on 18 July 1978 in the Buffalo District with the Service. A copy of my request was forwarded to your office. Enclosed is a letter of response dated 2 August 1978 from the U.S. Fish and Wildlife Service.

Paragraph two of the enclosed letter states that the U.S. Fish and Wildlife Service agrees with the contents of our minutes of 18 July 1978. The remaining paragraphs discuss issues which my staff will be able to address with no difficulty. I believe that the meeting and the exchange of letters have resolved the problems which would have kept the Corps from addressing the original Department of the Interior comments in a manner consistent with our regulations and standards.

Sincerely yours,

Incl
as stated

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

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CF: NCBCO-E

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
William C. Hennessy, Commissioner

1220 Washington Avenue, State Campus, Albany, New York 12232

August 23, 1978

Mr. Daniel D. Ludwig, P. E.
Colonel, Corps of Engineers
Buffalo District
Department of the Army
1776 Niagara Street
Buffalo, NY 14207

Re: DEIS for NYSE & G Somerset Station
Niagara County

Dear Colonel Ludwig:

In response to your letter of August 2, 1978 to Commissioner Hennessy, please be advised that this Department has no active plans to implement the proposed Lake Ontario State Parkway, nor do we expect that we shall within the foreseeable future. We concur with the applicant and the ENCRPB that there is sufficient location and design flexibility in the vicinity of the referenced proposal so that the proposed parkway could be routed around it. Therefore, we do not believe that there is a conflict between this proposal and the Parkway proposal.

Thank you for the opportunity to clarify our position on this matter.

Sincerely,

H. B. Clarkson

H. B. CLARKSON, Director
Project Development Bureau

HBC/JHB/dc

cc: T. P. Curran, DEC
D. H. Ketchum, Region 5

STATE OF NEW YORK DEPARTMENT OF PUBLIC SERVICE

EMPIRE STATE PLAZA, ALBANY 12223

PUBLIC SERVICE COMMISSION

CHARLES A. ZIELINSKI
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KAREN S. BURSTEIN

PETER H. SCHIFF
General Counse

SAMUEL R. MADISON
Secretary

To permit file.

September 7, 1978

Hon. Samuel R. Madison
Secretary
NYS Board on Electric Generation Siting
and the Environment
NYS Public Service Commission
Empire State Plaza
Albany, New York 12223

Re: CASE 80002 - New York State Electric and Gas Corporation - Somerset Station - Draft Discharge Permit.

Dear Secretary Madison:

By this letter, staff of the Public Service Commission recommends that the Siting Board make certain changes to the draft Section 402 discharge permit. These changes are necessary to accommodate the installation of a flue gas desulfurization system.

Earlier in this proceeding, staff and DEC prepared and submitted a draft discharge permit under Section 402 of the Federal Water Pollution Control Act Amendments. That draft discharge permit assumed that NYSE&G would burn low sulfur coal to meet then-applicable federal and state air quality standards for SO_2 emissions. The draft permit for the Somerset site (Exh. 70 with January 10, 1978 errata) was accepted by the Examiners with minor additions to the monitoring requirements (Recommended Decision at 146).

Since the passage of amendments to the Federal Clean Air Act and the promulgation of regulations to implement those amendments, NYSE&G has determined that it now must install a flue gas desulfurization system (letters of June 6 and June 20, 1978 from Norman Spindel to Secretary Madison).

The FGD system proposed by the company is a limestone throwaway type, as described in Exhibit 71 and recommended by the Examiners at page 113 of their report. The installation of a scrubber makes necessary certain changes to the draft discharge permit, and NYSE&G has recently informed staff of the nature of those changes. The attachment to this letter contains staff's recommended modifications to the draft permit for the Somerset site.

Considering the breadth and complexity of the draft permit, the FGD modifications are few and represent only minor shifts in numerical values. It is staff's opinion that the modifications to the draft permit to accommodate a scrubber do not materially change the predicted impact to Lake Ontario, both in terms of water quality and aquatic biology. In fact, since waste water which would have been discharged now will be used as make-up water for the scrubber, the volume of water to be discharged to Lake Ontario decreases. No flow from the combined plant effluent is now expected during normal station operating conditions (see new footnote "c" to Outfall No. 001E).

Apart from the FGD modifications, staff is taking this opportunity to add a paragraph to the draft permit in response to a regulation recently promulgated by the U.S. Environmental Protection Agency (see Federal Register, May 23, 1978, p. 22163). New Section 124.42 of 40 CFR requires that the permit issued by the Siting Board state that the permit will be revised or modified if EPA, in the future, promulgates guidelines or regulations for effluent limitations, for new source performance standards, or for pretreatment standards which are not addressed by present regulations or guidelines or which are more stringent than those in the draft permit. We proposed to add a paragraph containing this statement to page 35 of the Somerset draft permit.

Twenty five copies of this letter and attachment are being delivered to central files of the Commission and at least one copy is being served on all parties, the EPA, and other interested federal agencies.

Respectfully submitted,

MICHAEL FLYNN
Staff Counsel

cc: All parties and interested federal agencies.

Attachment

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 7-484-29 22 September 1978
Applicant: NYS Electric & Gas Corp.

Dr. William Murtagh
Keeper of the National Register
Office of Archaeological and
Historic Preservation
Heritage Conservation and
Recreation Service
ATTN: Ms. Sarah Bridges
Department of the Interior
Washington, DC 20240

Dear Dr. Murtagh:

I am currently processing a Department of the Army permit application from the New York State Electric and Gas Corporation requesting authorization to perform certain work in Lake Ontario that involves a potential site for an 850-megawatt coal-fired steam electric generating station located in the Town of Somerset, Niagara County, New York. The site occupies 963 acres and is located at latitude 43°-21'-43"N and longitude 78°-36'-16"W on the southern shore of Lake Ontario.

The work requiring a Department of the Army permit involves the construction of a raw water intake and effluent discharge system along with the dredging necessary to facilitate construction. These activities are subject to regulation under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act of 1972. Although the work proposed is rather limited in scope, I decided to prepare an environmental impact statement (EIS) since issuance of the Corps permit would ultimately lead to the construction and operation of a large power generating complex.

During the preparation of the draft EIS, the applicant was directed to perform a cultural resources survey at the Somerset site. This initial survey was completed and a report summarizing the findings was sent to the following individuals for review and evaluation during March 1977.

- Orin Lehman, Commissioner, NYS Office of Parks and Recreation, Albany, New York
- David Clark, National Park Service, Boston, Massachusetts

NCBCO-S
Dr. William Murtagh

Comments received from the State Historic Preservation Officer (SHPO) on 15 November 1977 advised that the George Badgley House and the Van Wagoner House may meet the criteria for inclusion in the National Register, but that additional information was necessary. Due to complexities involved in the applicant's ultimate choice of the Somerset site, the additional information was not completed until 20 September 1978. The SHPO has, therefore, not yet been afforded the opportunity to review and comment on these new materials. Comments received from the National Park Service on 22 March 1977 reinforced the potential eligibility of the Badgley and Van Wagoner properties for inclusion in the National Register and also indicated that the J.H. Pettit Farm may meet eligibility requirements.

On 15 May 1978 the draft EIS was filed with the U.S. Environmental Protection Agency in Washington, DC. During the 45-day review period the Advisory Council on Historic Preservation and the U.S. Department of the Interior commented on the potential eligibility for inclusion in the National Register of those sites discussed in the draft EIS which might meet the criteria for inclusion. In accordance with Title 36 Code of Federal Regulations Part 800.4(a)(2) of the Advisory Council Procedures, I am requesting that you determine the eligibility of the George Badgley House, the Van Wagoner House, and the J.H. Pettit Farm for inclusion in the National Register. To assist you in this task, I have enclosed the necessary documentation for each potentially eligible site.

I am also sending a copy of this documentation and cover letter to the New York State Historic Preservation Officer and a copy of the cover letter to the Advisory Council on Historic Preservation.

In light of the importance of energy-related projects and the processing time which has already been lost due to complexities involved in selection of power plant sites in the State of New York, I am requesting your consideration in expediting these determinations of eligibility.

If you have any further questions regarding this request or the accompanying documentation, please contact Mr. Arthur Marks of my staff by calling FTS 473-2329 or COM A/C 716, 876-5454, extension 2329.

Sincerely yours,

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incls
as stated

mld

NCBCO-S

27 September 1978

Mr. Paul Hamilton
Field Supervisor
U.S. Fish & Wildlife Service
100 Grange Place
Cortland, NY 13045

Dear Mr. Hamilton:

The U.S. Department of the Interior commented on our draft Environmental Impact Statement for the proposed Cayuga Station at Somerset, N.Y., by letter designated ER 78/401, dated 6 July 1978. One of the general comments contained in the letter advised that the data base pertaining to fisheries was inappropriate and inadequate. Clarification of this comment was obtained from a member of your staff, Lynn Lewis, during a meeting held at the Buffalo District office on 18 July 1978. The comment was generated, in part, on the premise that only a one year fish sampling program was conducted at the site. In actuality, the applicant conducted surveys from 1972 to 1977. Enclosed for your information is a copy of the additional data on fish populations at the Somerset site. A summary of this information will appear in the final EIS.

If you have any questions regarding the above, please call Mr. Thomas Glatzel of my staff by calling FTS 473-2307.

Sincerely yours,

CF: NCBCO-S

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

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NEW YORK STATE PARKS & RECREATION Agency Building 1 Empire State Plaza Albany New York 12238 Information 518 474 [illegible]
Orin Lehman Commissioner

3176

October 12, 1978

Dr. William Murtagh
Keeper of the National Register
Office of Archaeology and Historic
Preservation
Heritage Conservation and Recreation
Service
U.S. Department of the Interior
Washington, D.C. 20240

Dear Dr. Murtagh:

Re: 850-megawatt coal-fired steam
electric generating station
Somerset, Niagara County

The State Historic Preservation Officer (SHPO) has reviewed material submitted by the Buffalo District, Corps of Engineers concerning cultural resources located within the above project area, and has evaluated all structures and archeological resources in accordance with the National Register of Historic Places, Criteria for Evaluation.

It is the opinion of the SHPO that the J.H. Pettit House and associated outbuildings and features do not meet the criteria for inclusion in the National Register of Historic Places. The property does not have sufficient historical, or architectural, merit to meet the National Register criteria. Although representative of nineteenth century life, the complex is not an outstanding example of its type, nor is it even an important example within this particular area of New York State.

On November 15, 1977 the SHPO requested that sufficient information be provided for the SHPO to comment on the eligibility of the George Badgley Farm complex for the National Register. Based upon the additional information which has now been provided, it is the SHPO's opinion that this complex does not meet the National Register criteria. The George Badgley Farm residence was completely destroyed by fire, so that the complex now consists only of a variety of barns and other dependencies. Although the barns pictured in photographs number two and three are of some interest, they do not by themselves constitute a National Register district. Without the main residence this complex lacks integrity and is not a representative example of its type within this area of the state.

The Morgan Van Wagoner House, and the midden associated with the house appear to be eligible for inclusion in the National Register. The house, constructed of cobblestones is significant both architecturally and historically. Associated with the development of the Erie Canal, cobblestone structures were built by the same masons who worked on the canal. Geographically, the cobblestone buildings which have been documented in New York State are generally located within a 75-mile radius of Rochester, New York. The Van Wagoner House, a good example of cobblestone construction, is considered to be better than others in the vicinity.

Should you have any questions, please contact the project review staff at 518-474-3176.

Sincerely,

STATE HISTORIC PRESERVATION OFFICER

By Stephen J. Raiche
Director
Historic Preservation Field Services

LRK:mr

cc: Daniel D. Ludwig
Colonel, Corps of Engineers
District Engineer
Department of the Army
Buffalo District Corps of Engineers
1776 Niagara Street
Buffalo, N.Y. 14207

United States Department of the Interior

HERITAGE CONSERVATION AND RECREATION SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO: H32-NR

Mr. Daniel D. Ludwig, P.E.
Colonel, Corps of Engineers
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

NOV 30 1978

Dear Mr. Ludwig:

Thank you for your letter requesting a determination of eligibility for inclusion in the National Register pursuant to Executive Order 11593 or the National Historic Preservation Act of 1966, as amended. Our determination appears on the enclosed material.

As you understand, your request for our professional judgment constitutes a part of the Federal planning process. We urge that this information be integrated into the National Environmental Policy Act analysis in order to bring about the best possible program decisions. This determination does not serve in any manner as a veto to uses of property, with or without Federal participation or assistance. Any decision on the property in question and the responsibility for program planning concerning such properties lie with the agency or block grant recipient after the Advisory Council on Historic Preservation has had an opportunity to comment.

We are pleased to be of assistance in the consideration of historic resources in the planning process.

Sincerely yours,

William J. Murtagh
Keeper of the National Register

Enclosure

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: DOD/COE/Daniel D. Ludwig

Date request received: 9/29/78; 10/18/78

Name of property: J. H. Pettit Farm **State:** NY

Location: Lake Road, Somerset

Opinion of the State Historic Preservation Officer:

( ) Eligible (x) Not eligible ( ) No response

Comments:

The Secretary of the Interior has determined that this property is:

( ) Eligible Applicable criteria:

Comments:

(x) Not eligible

Comments: While the J.H. Pettit Farm has the potential to yield some types of information about 19th century agrarian complexes, the property does not possess sufficient architectural or historical significance to meet the National Register criteria.

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Charles A. Adams

Keeper of the National Register

Date: 12.4.78

NPS-10-900-a
OMB No. 1024-0018
8/86

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: DOD/COE/Daniel D. Ludwig

Date request received: 9/29/78; 10/18/78

Name of property: Morgan Van Wagoner House **State:** NY

Location: Hosmer Road, Somerset

Opinion of the State Historic Preservation Officer:

(x) Eligible ( ) Not eligible ( ) No response

Comments:

The Secretary of the Interior has determined that this property is:

(x) Eligible Applicable criteria: C

Comments: The Morgan Van Wagoner House embodies the characteristics of Cobblestone construction, a method of construction which was utilized in the area of Rochester, N.Y. during the period of the development of the Erie Canal. Built in 1848, the Van Wagoner House is a good example of a mid-19th century vernacular rural dwelling; detailing is derived from the Greek Revival and Italianate styles. The foundation of a second building and two refuse deposits located in the immediate vicinity of the house also contribute to the significance of the property.

Comments:

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Please Note:
The acreage included in this request (382.2) appears to be unnecessarily large. We recommend a boundary which encompasses the complex and its setting. We would be pleased to comment further if the consideration of your project's impact necessitates a precise definition of the resource's boundaries.

Charles A. Thomas

Keeper of the National Register

Date: 11.30.78

WASO-NRS 9/75

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: DOD/COE/Daniel D. Ludwig

Date request received: 9/29/78; 10/18/78

Name of property: George Badgley Farm **State:** NY

Location: Potter Road, Somerset

Opinion of the State Historic Preservation Officer:

( ) Eligible (x) Not eligible ( ) No response

Comments: The George Badgley Farm residence was completely destroyed by fire, so that the complex now consists only of a variety of barns and other dependencies..... Without the main residence this complex lacks integrity and is not a representative example of its type within this area of the State.

The Secretary of the Interior has determined that this property is:

( ) Eligible Applicable criteria:

Comments:

(x) Not eligible

Comments: While some of the barns on the Badgley Farm may have the potential to yield some types of information, the integrity of this complex has been diminished by the loss of the Badgley House. The barns do not appear to possess sufficient significance to meet the National Register criteria.

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Keeper of the National Register

Date: 12-1-79

WASO-185
9/75

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

DEPARTMENT OF THE ARMY

BUFFALO DISTRICT, CORPS OF ENGINEERS

1776 NIAGARA STREET

BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-484-29 8 December 1978
Applicant: New York State Electric & Gas Corp.

SUBJECT: Cayuga Station FEIS

Mr. Jordan Tannenbaum
Advisory Council on
Historic Preservation
1522 K. Street N.W.
Washington, DC 20005

Dear Mr. Tannenbaum:

I am currently processing a Department of the Army permit application from the New York State Electric and Gas Corporation associated with the construction of an 850-megawatt coal-fired power plant to be located at Somerset, New York. On 15 May 1978 I issued a draft Environmental Impact Statement (EIS) addressing the site for the proposed Cayuga Station.

The Advisory Council on Historic Preservation commented on our draft EIS by letter dated 31 May 1978. The council advised that two properties within the proposed Somerset site, the Van Wagoner House and the Badgley House, may be eligible for inclusion in the National Register of Historic Places. Additionally, the applicant's consultant, Peter Pratt, recommended the Pettit Farm be considered for eligibility.

In accordance with Section 800.4(a) of the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800), I prepared the necessary documentation for three properties and submitted a request for determinations of eligibility to the Keeper of the National Register by letter dated 22 September 1978. The Keeper of the National Register, by letter dated 30 November 1978, advised me that only the Van Wagoner House is eligible for inclusion in the National Register. Copies of the Determination of Eligibility Notification for each of the sites are enclosed. These determinations are in concurrence with those of the State Historic Preservation Office.

In an attempt to keep on schedule with the issuance of the final EIS, I am proposing the following procedure which will allow for a timely decision on the permit action and compliance with Advisory Council Procedures contained in 36 CFR part 800 and with Section 106 of

NCBCO-S Re: 76-848-29
Applicant: New York State Electric & Gas Corporation

the National Historic Preservation Act of 1966. My proposal is to issue the final EIS with a statement indicating that prior to any approval of Department of the Army permit, I will assure that the requirements of Section 106 of the National Historic Preservation act of 1966 are met and that the remaining steps of Section 800 of the Advisory Council's Procedures (36 CFR 800) are completed. This statement will be contained in the Cultural Resource Section of the final EIS, Chapter 4, and in response to the Advisory Council's 31 May 1978 letter of comment (FEIS, Appendix G).

I believe that sufficient time exists for compliance with the above stated requirements prior to a decision on permit issuance since this decision is scheduled for early 1979.

I would appreciate a written response from you, at the earliest possible date, regarding your views on this matter.

If you should have any questions, please contact Mr. Robert Rothman by calling FTS 473-2323.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incl
as stated

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

NCBCO-S Re: 76-484-29 13 December 1978
Applicant: New York State Electric & Gas Corp.

SUBJECT: Proposed Cayuga Station

Orin Lehman, Commissioner
NYS Office of Parks and Recreation
ATTN: State Historic Preservation Office
Agency Building No. 1
Empire State Plaza
Albany, NY 12238

Dear Mr. Lehman:

I am currently processing a Department of the Army permit application from the New York State Electric and Gas Corporation associated with the construction of an 850-megawatt coal-fired power plant to be located at Somerset, New York. On 15 May 1978 I issued a draft Environmental Impact Statement (EIS) addressing the site for the proposed Cayuga Station.

The Advisory Council on Historic Preservation commented on our draft EIS by letter dated 31 May 1978. The council advised that two properties within the proposed Somerset site, the Van Wagoner House and the Badgley House, may be eligible for inclusion in the National Register of Historic Places. Additionally, the applicant's consultant, Peter Pratt, recommended the Pettit Farm be considered for eligibility.

In accordance with Section 800.4(a) of the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800), I prepared the necessary documentation for three properties and submitted a request for determinations of eligibility to the Keeper of the National Register by letter dated 22 September 1978. The documentation including photographs was also sent to your office on 22 September 1978. The Keeper of the National Register, by letter dated 30 November 1978, advised me that only the Van Wagoner House is eligible for inclusion in the National Register. Copies of the Determination of Eligibility Notification for each of the sites are enclosed (Inclosure I).

NCBCO-S Re: 76-484-29
Applicant: New York State Electric & Gas Corp.

In accordance with the requirements of Section 106 of the National Historic Preservation Act of 1966 and the Advisory Council on Historic Preservation Procedures contained in 36 CFR Part 800, I must proceed with the remaining steps of Section 800 (36 CFR 800) prior to a decision on permit issuance. I am, therefore, requesting your opinion in accordance with 36 CFR Part 800, Sections 800.4, 800.8, and 800.9 regarding the effect of the proposed Cayuga Station on the Van Wagoner House which has been listed as eligible for inclusion in the National Register. Should your opinion advise of adverse effects as indicated in 36 CFR Part 800.9, I would appreciate your recommendations regarding altenatives that would avoid and/or mitigate any adverse effect. To facilitate your review, I have enclosed appropriate sections of the draft EIS along with some updated information (Inclosure 2). A copy of the entire draft EIS is also enclosed.

I consider this energy related project important and would like to avoid delays which would prevent a timely decision on this permit application. Therefore, I would appreciate a written response from you on or about 4 January 1979.

If you should have any questions, please contact Mr. Robert Rothman of my staff by calling A/C 716, 876-5454, extension 2323. I appreciate your cooperation and coordination in this matter.

Sincerely yours,

Incls NFR
as stated

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

CF: NCBCO-S

Rothman RR 13 Dec 78
for Leuchner 13 Dec 78
Hair
Counsel
~~Counsel~~
DDE
DE 15

Advisory Council On Historic Preservation

1522 K Street NW.
Washington D.C.
20005

December 15, 1978

Colonel Daniel D. Ludwig, P.E.
District Engineer
Buffalo District
Corps of Engineers
U.S. Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in response to your letter of December 8, 1978, concerning a Department of the Army permit application from the New York State Electric and Gas Corporation associated with the construction of an 850-megawatt coal-fired power plant to be located at Somerset, New York.

We have reviewed your suggested procedure for complying with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320) and the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800). As long as publication of the Final Environmental Impact Statement will not foreclose any alternatives under the Section 106 process, we are satisfied that the proposed compliance time table and your commitment to ensure complete compliance with all applicable historic preservation requirements will adequately provide for the protection and preservation of cultural resources in the project area.

We look forward to working with the Corps in the resolution of all outstanding compliance issues following publication and circulation of the Final Environmental Statement for this project.

Please feel free to contact me if the Council may be of any further assistance to you.

Sincerely,

Myra F. Harrison

Myra F. Harrison
Assistant Director
Office of Review and Compliance

APPENDIX F: WATER QUALITY OF SLUDGE/ASH DISPOSAL AREA SEDIMENTATION POND EFFLUENT

F.001
The design of the ash disposal operation is such that adverse water quality impacts will be minimal. Water collected and treated in the sedimentation ponds will be monitored to insure a pH of six to nine and a maximum suspended solids content of 50 ppm before discharge. The water will also be monitored for the presence of potentially toxic elements. In the unlikely event that concentration of these elements exceed water quality guidelines, provisions will be made for further treatment.

F.002
Data from the applicant's Milliken Station ash disposal pond outfall can be considered generally representative of the probable water quality resulting from the sedimentation pond outfalls at the Somerset disposal site. However, variations in actual characteristics are expected due to varying coal sources, ash characteristics, etc. The available analyses from the Milliken ash pond outfall are presented in Table F-1. Assuming the Milliken values are representative of an effluent from the proposed disposal operation, several sources were utilized to determine if existing water quality standards and criteria will be met.

F.003
As can be seen from Table F-1, the projected discharge is in conformance with applicable Federal and State standards. The Federal standards applied are those relating to "rainfall runoff from, or through any coal, ash or other material storage pile" as presented in 40 CFR 423.

F.004
There are several State water quality standards applicable to the water receiving the discharge from the sedimentation pond. The standards for Class D streams apply to all of the discharge with the exception of the Phase I discharge at Somerset which will be discharged to Lake Ontario, a Class A waterbody. Class D waters are suitable for secondary contact recreation, but due to intermittent flow (as is the case of the receiving streams at the disposal site) or other factors, the streams do not support the propagation of fish.

F.005
The New York State DEC has established an internal policy to the effect that only 10 ppm of suspended solids should be discharged to an intermittent stream. The 10 ppm established by this policy is considerably lower than the Federal standard. The rationale for this State policy is that there will be no dilution water available in

intermittent streams during part of the year; and, therefore, the treatment system must produce an effluent that meets stream standards. It should be pointed out that the present Milliken ash pond discharge meets even this lower State policy, and that since the ash disposal site produces no effluent in and of itself, there should be water in the receiving stream from the same rainfall runoff to act as dilution water at the time the pond is discharging.

F.006

Several heavy metal criteria for freshwater organisms are based upon the 96-hour LC_{50} for the most sensitive organisms in the receiving waterbody (Table F-1). The 96-hour LC_{50} is the lethal concentration resulting in the mortality of 50 percent of a sample after a 96-hour exposure. Since the purpose of a criterion is to provide protection to the whole population, only a fraction of the LC_{50} is allowed in the discharge by these criteria. This fraction is called an application factor in NAS/NAE (1973). Using an example from Table F-1, the application factor for copper which results in a safe concentration in the discharge is one-tenth the 96-hour LC_{50}. A discussion of available data for each of the chemical species (Cu, Ni, Zn) with this type of criteria will be helpful in determining the acceptability of the projected discharge from the sedimentation pond.

F.007

The following table indicates safe concentration of copper in discharges in order to protect aquatic organisms:

	Safe Level (ppm)	
	Soft Water (30-45 ppm as $CaCO_3$)	Hard Water (200 ppm as $CaCO_3$)
Species		
Daphnia magna	.006	-
Rainbow trout	.01	0.035
Fathead minnow (reproduction)	0.011-0.018	0.015-0.033
Brook trout (reproduction)	0.01-0.018	-

F.008

Data from the Milliken sedimentation pond discharge indicate a copper concentration of 0.01 ppm. The above safe concentrations equal or exceed this projected discharge level with the single exception of Daphnia, which has a safe level in soft water of 0.006 ppm copper. The safe levels in hard water are consistently higher than in soft water. Since the projected discharge exhibits a total dissolved solids concentration of 239.5 ppm, this discharge can be considered

to be hard water. Thus, the safe concentration for Daphnia in hard water would probably be somewhat higher than the soft water level shown above, indicating that this species might also be protected. Based upon these data, the level of copper in the discharge from the sedimentation pond can be considered to adequately protect organisms in the receiving water.

F.009
Nickel has an application factor of 2/100 (0.02) times the 96-hour LC_{50} of the most sensitive organisms inhabiting the receiving water. The following are 96-hour LC_{50} data for nickel available in Water Quality Criteria, 1972 for the fathead minnow:

LC_{50} - 96-hour (ppm)

Soft Water	Hard Water
5 (20 ppm $CaCO_3$)	43 (360 ppm $CaCO_3$)
	26-31 (200 ppm $CaCO_3$)

F.010
These data yield safe levels ranging between 0.1 ppm Ni in soft water to as high as 0.86 ppm Ni in hard water. The nickel level in the proposed discharge (0.0155 ppm) is considerably below even these safe levels and will present no danger to the aquatic organisms in the receiving streams or water bodies.

F.011
Similar to the preceding discussion, Water Quality Criteria, 1972 presents zinc LC_{50} data for both hard and soft water for the fathead minnow (the application factor for zinc is 0.005). It should be noted that in view of the total dissolved solids concentration of 239.5 ppm in the Milliken discharge, this water can be considered to be hard, indicating that the hard water tolerances would best apply to the proposed discharge. In hard water, the fathead minnow had a 96-hour LC_{50} of 33 ppm (33 times the 0.005 application factor yields a safe level at 0.165 ppm). In soft water (20 ppm as $CaCO_c$) the LC_{50} was 0.87 ppm, which yields a safe level for soft water of 0.004 ppm. This value is somewhat below the projected discharge concentration, but since the test was conducted in soft water, this result does not apply directly to the proposed discharge. In a chronic test in hard water of fathead minnow reproduction, a safe concentration of zinc was found to be 0.03 ppm. Fecundity of this species was reduced 85 percent at 0.18 ppm zinc. In soft water, the reproduction of Daphnia magna was unaffected at 0.07 ppm, but reduced at 0.1 ppm. All of the above data indicate that the projected concentration of zinc in the proposed discharge of 0.015 ppm (Table F-1) will have no effect on the aquatic life in the receiving water.

F.012
Several of the criteria presented under "Freshwater Organisms" in Table F-1 are representative of the range of concentration found in nature. In all cases, the projected ash disposal area falls well within the existing range. No impact is therefore expected.

F.013
One constituent in the projected discharge (lead) exceeds the recommendation for freshwater organisms. Lead has a reported value of 0.035 ppm in the Milliken pond discharge and a recommended level of 0.03 ppm. The recommendation is based on the safe level for Daphnia. This level was also considered safe for fish and it was noted that detrimental effects could occur at concentrations two to three times greater than 0.03 ppm. The difference between the recommended and projected levels of lead is small, and no detrimental effects are expected.

F.014
In summary, the water quality of the proposed discharge from the ash disposal sites will meet all Federal and State standards for such a discharge. In addition, the undiluted discharge meets all of the criteria for a public water supply and will provide protection to freshwater organisms. The design of the disposal site ensures that all water coming into contact with the ash pile will be collected and diverted to the sedimentation ponds.

Ash and FGD Sludge Disposal Discharge

F.015
The disposal of both ash and FGD sludge further minimize and essentially eliminates possible adverse impacts. The FGD sludge will be stabilized, resulting in a basically impermeable mass having the characteristics of low strength concrete. The stabilized sludge will be unsaturated and will continue to harden with age. Landfill runoff will be promoted by a properly engineered landfill. No leachate production is thus expected. Surface runoff characteristics based on laboratory testing are presented in Table F-2. Due to the alkaline nature and high hardness, the solubility of heavy metals will be reduced from that encountered with ash disposal as previously discussed. The data for the older stabilized sludge are considered to be more representative of actual landfill conditions since the runoff from exposed fresh stabilized sludge represents only a small portion of the total runoff from the disposal site. Finally, the landfill will be engineered to promote rapid runoff thereby minimizing contact time with the fill material and thus extent of dissolution of substances.

TABLE F-1

PHYSICAL AND CHEMICAL WATER QUALITY OF THE MILLIKEN ASH DISPOSAL DISCHARGE
AND RELATED WATER QUALITY STANDARDS AND RECOMMENDATIONS

Parameter (units)	Milliken[a]	Water Quality Criteria: 1 Federal Standard[c]	2 State Standard[d]	3 Public Water Supplies	4 Freshwater Organisms
pH	8.04	6-9	6-9.5	5-9	6.5-8.5
Suspended Solids (ppm)	1.5	50	10		25
Total Dissolved Solids (ppm)	239.5			500	169(72-400)[e]
Conductivity (micromhos)	359.5				
Chlorides (ppm)	17[b]			250	9(3-170)[e]
Sulfates (ppm)	52.6			250	32(11-90)[e]
COD (ppm)	13.345				
Iron-Total (ppm)	0.23				
Iron (ppm)	0.14			0.3	
Aluminum (ppm)	0.09				
Chromium (ppm)	0.004			0.05	0.05
Cadmium (ppm)	0.001		0.3	0.01	0.004-0.03
Copper (ppm)	0.01		0.2	1	(0.1)96 hr LC_{50}
Lead (ppm)	0.035			0.05	0.03
Nickel (ppm)	0.0155				(0.02)96 hr LC_{50}
Zinc (ppm)	0.015		0.3	5	(0.005)96 hr LC_{50}
Manganese (ppm)	0.012			0.05	
Potassium (ppm)	1.725				10(6-85)[e]
Titanium (ppm)	nd				
Sodium (ppm)	12.175			No Limit	10(6-85)[e]
Mercury (ppb)	0.2			2	0.2

a) Averages of determinations on 3-1-77 and 4-1-77, from the ash disposal sedimentation pond outfall; (nd = not detected).
b) Only one chloride determination, 3-1-77.
c) 40 CFR 423 (Federal Register 39(196): 36206-36207).
d) NYS DEC Policies and Procedures Manual - Title 9100, paragraph 9141.17, Table 1 - Effluent Standards.
e) Dissolved constituents representative of about 90 percent of the total stream flow in the United States - median (range).

Table F-2 - Results of Runoff Tests on a Stabilized Utility Sludge Sample[a]

Constituent	CONCENTRATION (PPM, except pH)	
	Immediate	After 14 Days
pH	9.8	7.6
'thn. Alkalinity	10.	0.
MO Alkalinity (Total)	150.	20.
Hardness	250.	20.
SO_3	30.	5.
SO_4	196.	16.
Cl	10.	6.
Total Dissolved Solids (Meter)	330.	60.
Al	3.	.1
As	.035	.002
Ca	100.	8.5
Cd	.005	.01
Cr	.05	.05
Cu	.02	.07
Fe	.1	.1
Hg	-	-
K	.20	.74
Mg	.08	.04
Mn	.02	.02
Na	1.00	.63
Pb	.05	.05
Sn	1.	1.
Ti	1.	1.
Zn	.02	.05
Total Solids	400.	110.

(a) IU Conversion systems laboratory data obtained from IUCS standard runoff test procedure for a combined fly ash and sludge sample. Runoff volume is equivalent to a two-inch rainfall in 60 minutes. Data shown water quality improvement with age of sample.

APPENDIX G

COMMENTS RECEIVED ON DRAFT EIS AND CORPS RESPONSE TO COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

Class. ER-2

27 JUN 1978

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The EPA has reviewed the draft environmental impact statement (EIS) issued by your office in connection with an application by New York State Electric and Gas Corporation for sections 10 and 404 permits to construct cooling water structures and to protect the shore with riprap for a power station in the Town of Somerset, Niagara County, New York. Proposed for "once-through" cooling using Lake Ontario water, the plant would generate 850 megawatts of steam electric power by burning coal.

The EPA has previously commented to the Corps (letter dated 22 August 1977) on the environmental assessment for the proposed power plant on Cayuga Lake or Lake Ontario, and found the latter site preferable. Accordingly, the option by the draft EIS for the Somerset site on Lake Ontario predisposes that EPA's comments would be generally favorable. Nevertheless, certain environmental aspects of the Somerset site have not been adequately evaluated in the draft EIS. The following comments are offered for your consideration in preparing a final EIS.

Air Quality Impacts

1 The EPA has already reviewed, and found acceptable, the applicant's submittal under the existing Prevention of Significant Deterioration (PSD) requirements. However, the applicant will be subject to revised PSD regulations pursuant to the August 7, 1977 Clean Air Act amendments. As proposed, these regulations require an additional assessment of the proposed power plant's impacts on growth, soils, vegetation and visibility. The final EIS should include this assessment.

2 Although the statement on page 4-77 of the draft EIS that the stack effluent will not contain photochemical oxidants is correct, all ingredients necessary for the photolytic reaction will be present.

G-1

Corps Response to United States Environmental Protection Agency (USEPA)

1 To satisfy the requirements found in 40 CFR 51.24(p), additional impact assessments were performed by the applicant and presented in the PSD application dated 24 July 1978. The analysis has shown that the plant will not produce significant recognizable impairment to soils, vegetation, and visibility and will have minimal effects on growth. Paragraphs 4.216 through 4.225 discuss effects of plant emissions on vegetation. Paragraph 4.225 has been modified to state that plant emissions will not have a significant impact on soils. A discussion of the impacts of the proposed facility on visibility has been included in Paragraph 4.226. Paragraph 1.152 has been amended to reflect the increase in plant work force needed to accommodate the FGD system. Data in Paragraphs 4.262 through 4.277 have also been amended to reflect this change. Paragraphs 4.054 through 4.065 and 4.262 through 4.279 discuss growth associated with facility construction and operation. An additional assessment of plant impact on growth is presented in Paragraph 4.275a. This paragraph also states that secondary growth associated with the proposed plant will not have a significant impact on air quality in the area. If necessary, the applicant will provide additional impact analysis to the EPA to satisfy the requirements of the Clean Air Act Amendments of 1977.

2 Paragraph 4.199 has been amended to include the fact that ingredients necessary for the photolytic reaction will be present in plant emissions and to describe the principal chemical species involved.

3 Paragraphs 6.068-6.073 have been supplemented with information pertaining to various intake depths and designs. Mechanisms or devices for protecting or returning fish to the waterway are discussed in Paragraphs 6.082-6.084. These paragraphs have been expanded in accordance with this comment. Corps staff believes that the most effective means of reducing impingement and possibly entrainment, may be the use of uniform flow screens installed at the intake ports. However, these screens are still the subject of ongoing research and, thus, staff cannot conclusively state that they would protect organisms while reliably providing a source of power plant intake water.

4 A section on the expected effects of gas bubble disease has been added to the EIS and appears in Paragraph 4.134A.

Aquatic Impacts

Effluent guidelines for the steam-electric power industry have been published in the Federal Register. The guidelines, as applied to the proposed thermal discharge, would require closed-cycle evaporative cooling, with discharge of cold-side blowdown only, upon commencement of operation. It should be noted that section 316(a) of the Federal Water Pollution Control Act Amendments (FWPCAA) provides for a waiver of guideline limitations if it can be shown that the limitations for the control of the thermal component of the discharge are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population in and on the waterway. Further, section 316(b) of the FWPCAA requires that the location, design, construction and capacity of cooling water intake structures reflect the "Best Technology Available" (BTA) for minimizing adverse environmental impact. Closed-cycle cooling could also be required pursuant to section 316(b) as a means of achieving BTA.

3 The applicant has proposed a once-through cooling system with intake at the 30 feet depth contour with an elevation of five feet off the bottom. The EPA does not believe that the draft EIS adequately addresses the question of alternative intake systems to minimize impingement. The New York State Department of Environmental Conservation (NYSDEC) has suggested that angled screens, fish bypasses and perhaps louvres in the intake bay would significantly reduce fish impingement mortality. The EPA recommends that the impacts of these alternatives be assessed in the final EIS relevant to "Best Technology Available" for minimizing adverse environmental impact. The EPA suggests that the final EIS address impacts of various depths and designs.

Based on the data presented in the draft EIS, it appears that the operation of an 850 MWe fossil steam electric unit with a once-through cooling system consisting of an offshore discharge at the 25-foot depth contour should not significantly degrade the aquatic ecosystem; thus, the likelihood of propagation of a well balanced, indigenous population of shellfish, fish and wildlife in and on Lake Ontario appears high.

Based on the draft EIS, it appears that the diffuser design and location should not interfere with inshore movements of fish or with the littoral drift of sediments. We believe that the discharge velocity of 15 feet per second should prevent long-term residence of fish in the high temperature zones of the plume. Elevated temperatures in those areas of the plume where fish could maintain themselves should be small enough to prevent

4 altered gonadal development, weight loss, or increased disease. The draft EIS did not, however, address the possible impacts of gas bubble disease. It is requested that the final EIS do so.

Corps Response to USEPA Comments (Cont'd)

5 While an FGD system reduces SO_2 emissions, it does not entirely eliminate these emissions. Essentially, the proposed plant's contribution to acid rain is unavoidable since plans call for the use of high sulfur coal with an FGD system that is only 80 percent efficient. Additionally, tall stacks tend to distribute and disperse emissions over a great distance affecting regional areas. These facts have been added to Paragraph 5.007.

6 Paragraph 4.177 has been revised to indicate that all effluent will be treated prior to discharge to comply with New York State Department of Environmental Conservation regulations for water quality. The resultant discharge should not have significant adverse effects on the subject streams. Additional supporting data has been added to the EIS in new Appendix F.

7 The location of the dredged material disposal area may be found on Figure 1-11. The EIS has been revised so that Paragraph 1.046 describes the actual dredging operation and Paragraph 1.090 of the solid waste disposal section describes the dredged material disposal area and management of spoils. The area will be sealed with an impermeable liner and will be surrounded with an earth dike. A settling pond for containment and settling of runoff will also be provided.

8 Paragraph 6.067 has been modified to include the cost considerations used in selecting the once-through cooling system.

9 A discussion of the Resource Conservation and Recovery Act of 1976 (RCRA) and its applicability to the proposed facility has been added to the final EIS (Paragraph 1.114). The sections pertaining to solid waste impacts have been expanded in accordance with USEPA comments 10 through 19 which specify the areas of concern.

10 Paragraph 1.102 of the draft EIS indicated that 500 tons per year of wastewater treatment sludge would be disposed of at approved landfill areas. The applicant is also considering disposal of the subject solid waste in the onsite ash and stabilized FGD sludge disposal areas. At this point in time, no specific offsite landfills have been investigated by the applicant nor has the applicant finalized the disposal plant. The ultimate selection of onsite vs offsite disposal must be based on evaluation factors such as transportation costs, accessibility of offsite areas, the capacity of offsite areas, operating and maintenance costs, environmental considerations, and regulations governing solid waste disposal. The RCRA is expected to be implemented prior to station operation. Should wastewater treatment sludge be listed

5 It is requested that the final EIS explain why the proposed power plant's contribution to the regional problem of acid precipitation is considered unavoidable (section 5.007). Use of flue gas desulfurization should preclude this adverse impact, as well as the health effects of airborne sulfates.

6 The Somerset site is drained by Unnamed and Fish Creeks. Because Fish Creek would be flanked by ash disposal piles and would receive sedimentation pond effluent, statements of no adverse effects (section 4.176) should be supported by data.

7 The disposal location and management of spoils dredged from installation of intake and discharge structures should be discussed in the final EIS.

8 Section 6.067 of the draft EIS lists reasons why the applicant has opted for a "once-through" cooling system, yet the overriding reason, cost, is not included.

Solid Waste Impacts

9 Much additional information is needed before the solid waste impacts of the proposed site can be considered environmentally acceptable. The Corps may want to use the EPA publication "Guidelines for the Preparation of an EIA Report for New Source Fossil-Fueled Stream Electric Generating Stations" as a reference for discussion of environmental impacts of the proposed facility. The applicant should note that regulations concerning the storage, transportation, handling and disposal of hazardous waste are currently being developed under federal law (The Resource Conservation and Recovery Act of 1976, Subtitle C). The regulations, when finalized next year, may be applicable to the disposal operations proposed in this draft EIS.

10 As we understand it, 900 tons/year of sludge from wastewater treatment is to be disposed at approved landfills off-site. The sludge will consist of settleable, suspended and dissolved solids removed from the liquid wastes, and coagulant chemicals used to flocculate and precipitate these solids. This quantity of sludge could significantly affect a small landfill. Will disposal of this sludge have a detrimental effect on the capacity or operation of the anticipated disposal site? Is the sludge hazardous?

11 Maps should be included to show (1) the location of the disposal site (none of the site plans show the boundaries of the landfill), (2) ground water elevations below and around the site, and (3) the location of ground and surface water testing points.

12 In the discussion of permits required for the proposed facility, no mention is made of the need for a state permit for the on-site landfill.

C-3

Corps Response to USEPA Comments (Cont'd)

as "hazardous," Subtitle C of the RCRA would be applicable and disposal permits would be required. If Subtitle C is not deemed applicable, the sanitary landfill criteria of Subtitle D would apply. Disposal whether onsite or offsite will also be subject to State regulations for management of solid waste facilities (6 NYCRR part 360). Since the proposed facility will be subject to compliance with appropriate RCRA criteria and New York State
10 regulations, there is reasonable assurance that the disposal of wastewater treatment sludge, whether onsite or offsite, will not adversely affect health and the environment. Presently, neither the State of New York Department of Environmental Conservation nor the USEPA have specifically classified this sludge as being hazardous. While 900 tons per year of waste may adversely affect a small landfill, no specific offsite facilities have been investigated and effects cannot be evaluated.

11 Figure 1-3 has been revised to show the boundaries of the ash disposal areas. A cross section of the site showing ground water elevations is presented in new Figure 2-5a. Ground and surface water testing and monitoring points also appear on revised Figure 1-3. Sedimentation pond water quality will be monitored at the drop inlets. Ground water levels were recorded at coring sites shown on Figure 1-3. This figure also indicates the location of existing water wells on the site.

12 No separate State solid waste disposal permit, per se, is required. As stated in 6 NYCRR 360, Section 360.1 (f)(3), "Sites and facilities subject to approval pursuant to Article VII or VIII of the Public Service Law are exempt from procedural but not substantive provisions of this Part."

13 The ground water quality monitoring program for the disposal area has not been finalized. Consequently, information on the location and number of testing wells, sampling techniques, and parameters to be analyzed is not available. This will be developed during the final station design phase.

14 This comment refers to the water supply wells shown on Figure 2-5. These wells are not located along the eastern boundary of the site but actually lie totally within the site. Should the State of New York certify the Somerset site, water supply wells located within the site boundaries would no longer remain in private use. There are wells along the southern boundary of the site, however, the flow of ground water is northward toward Lake Ontario, away from the house wells. The stabilized FGD sludge is essentially impermeable (10^{-6} to 10^{-8} cm/sec) and will effectively serve as

13 Expansion of the discussion of ground water quality monitoring is needed. As stated above, the location and number of regular testing wells are needed. In addition, the final EIS should discuss the sampling techniques and the parameters to be analyzed.

14 The map on page 2-33 shows approximately 10 water supply wells along the eastern portion of the Somerset site. What impact, if any, will the new landfill have on these private wells?

15 The landfill will serve as a disposal site for bottom ash, fly ash, and pyritic waste. After reviewing a preliminary draft of the EIS, the NY Office of Environmental Planning recommended that the high water table not be within 5 feet of disposed ash and 10 feet of pyrites if any part of the disposal area is not protected by a liner. The draft EIS states that "pervious soil underlying the site will require (installation of) an impermeable liner." The applicant also plans to lower the water table through pumping in areas of the fill, yet admits no knowledge of the effect such lowering of the table will have on local ground water supply. The final EIS should explain why the applicant is planning to lower the water table if, in fact, an impermeable liner will be installed, and if the consequences of such pumping are not known.

16 It is requested that the final EIS explain why the chart on page 1-68 indicates that 5,000 tons/year of pyritic refuse is expected, while the discussion on page 1-71 estimates 20,000 tons/year. How long will the dry ash remain at the disposal pile adjacent to the disposal site before it is landfilled?

17 Additional data on the sedimentation ponds adjacent to the landfill should be included in the final EIS. Information on the location, size, and lining material (if any) is needed. A schedule, along with the method of testing of the surface water entering and leaving the ponds, should be included. It should be realized that ground water contamination is possible unless the ponds are impermeable, and that suitable provisions are needed for covering the ponds when they are no longer used, to prevent leaching or washing out of contaminants.

18 The draft EIS estimates that the agricultural cost to the area, due to the location of the disposal site, amounts to 30 times the annual agricultural value of $126,000. The assumption that the land used for disposal will return to its original usefulness after 30 years of disposal operations may be inaccurate. How can the land be recovered for agricultural productivity? Should it not be assumed that the 218 acres for disposal will never return to its original economic value?

19 Further discussion is needed on alternatives to the proposed disposal site. The draft EIS merely states that a second on-site landfill area was examined, but dropped from consideration when the cost estimate came to $300,000 more than the proposed site. No explanation is given

C-4

Corps Response to USEPA Comments (Cont'd)

14 a liner to prevent ground water contamination. With such a liner, there is no expected requirement to lower (by dewatering) the ground water table. Surface runoff from the disposal area will be collected, routed to sedimentation ponds, and monitored to ensure compliance with applicable regulations. No siginificant impact is expected.

15 The applicant's primary proposal has been changed since the publication of the draft EIS. Originally, the applicant proposed to burn low-sulfur coal without scrubbers. The applicant now plans to install an FGD system. Thus, the landfill will now serve as a disposal area for stabilized FGD sludge which is essentially impermeable. Thus, the applicant will use stabilized sludge as an impermeable liner and has no plans to lower the water table. Paragraph 4.176 has been amended to present this information. Figure 1-3 demonstrates that pyritic wastes are to be contained in a separate disposal area. Paragraph 1.087 has been revised to state that stabilized FGD sludge will be used to line the pyrite disposal area and encase the pyritic wastes.

16 The values of 5,000 tons/year and 20,000 tons/year are values from two different early filings by the applicant, the first for low sulfur coal, the latter for high sulfur coal. Based on more recent information, the value for use on both Table 1-16 and paragraph 1.105 has been corrected to 11,000 tons/year.

No dry ash or stabilized FGD sludge will be piled adjacent to the disposal site before landfilling. It will be immediately landfilled. The only exception may be bottom ash which may be stockpiled for use as cover material or for sale as a usable by-product.

17 The locations of sedimentation ponds adjacent to the landfill areas are shown on revised Figure 1-3. The sedimentation pond adjacent to disposal area I is approximately 2.3 acres in size. The pond adjacent to disposal area II is about 1.8 acres and the one adjacent to disposal area III is approximately 3.3 acres. Ponds will be lined with an as yet undefined impermeable material, which could include stabilized FGD sludge. The methods and schedule for runoff testing have not presently been finalized, but runoff will be tested for pH and TSS. Plans for ultimate pond decommissioning have not been developed. Such items will be developed during the final design phase.

18 The loss of 130 acres of agricultural land will occur in increments over the 30-year life of the plant and, thus, the loss is not exactly 30 times the annual agricultural value. The disposal

C-4

of why the second land area was considered, or of the environmental trade-offs between the two sites. Also, no off-site alternatives are considered. Although there may be additional problems with transportation, noise, dust, etc. associated with an off-site landfill, a site further inland with better hydrogeologic conditions may be preferable to the proposed site. The possibility of using existing private facilities for off-site disposal should also be discussed. 19

In light of these concerns and in accordance with EPA procedures, the draft EIS has been rated ER-2, indicating environmental reservations (ER) and a need for additional information (2). Please contact this office at 8-264-8556 if you have any questions.

Sincerely yours,

Daniel Sullivan

for Michael Bonchonsky
Acting Chief
Environmental Impacts Branch

cc: D.H. Hamilton, USDOE

C5

Corps Response to USEPA Comments (Cont'd)

site will preempt approximately 130 acres of cropland, but no more than two years of storage will be cleared at a time; therefore, the economic and crop impacts associated with solid waste disposal will accrue over the entire 30-year period. Consequently, the initial impacts may be minimal. Paragraph 4.183 has been amended to clarify this point. The draft EIS did not assume that the disposal site would be returned to its original usefulness relative to agriculture. However, a revegetation program will be undertaken. After each of these one- or-two-year segments has been built up to final design height, the area will be loamed and seeded in phases with grass, legume and shrub varieties as soon as practicable after the placement of final cover soil. Screen plantings are proposed at the perimeter of the site and many of the plantings will include trees and shrubs. The site restoration program will provide habitat to replace some of that lost to the facility. 18

Paragraph 1.114 has been revised to include a discussion on the possibility of using private landfills for solid wastes. Paragraph 1.114 of the draft EIS was in error regarding alternative sites. An extensive solid waste disposal site selection evaluation was performed by the applicant to determine the most environmentally acceptable and cost effective means of disposal. This evaluation also considered engineering aspects. The study included onsite and offsite disposal areas as well as reclamation sites (mined-out areas). This eventually resulted in identification of a prime (onsite) and alternate (offsite) area. Revised Paragraph 1.114 indicates that the offsite disposal area would cost about 1.8 million dollars per year more than the onsite area. Additionally, the offsite area does not offer any significant environmental advantages over onsite disposal. The conclusion that onsite disposal is the preferred alternative is also shared by the New York State Department of Environmental Conservation and New York State Department of Public Service. 19

Advisory Council on
Historic Preservation
1522 K Street NW
Washington, D.C. 20005

May 31, 1978

Colonel Daniel D. Ludwig, P.E.
District Engineer
Buffalo District
Corps of Engineers
U.S. Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in response to your request of May 3, 1978, for comments on the draft environmental statement for the proposed Cayuga Station, Somerset, New York. We have reviewed the statement and note that the undertaking will affect the Van Wagoner House and the Hedgley House, Niagara County, New York, properties that may be eligible for inclusion in the National Register of Historic Places.

Pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320) Federal agencies must, prior to the approval of the expenditure of any Federal funds or prior to the granting of any license, permit, or other approval for an undertaking, afford the Council an opportunity to comment on the effect of the undertaking upon properties included in or eligible for inclusion in the National Register of Historic Places.

Until the requirements of Section 106 are met, the Council considers the draft environmental statement incomplete in its treatment of historical, archeological, architectural and cultural resources. To remedy this deficiency, the Council will provide, in accordance with its "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800), substantive comments on the effect of the undertaking on these properties. Please call Jordan E. Tannenbaum at 202-254-3967 to assist you in completing this process.

Sincerely yours,

Myra F. Harrison

Myra F. Harrison
Assistant Director
Office of Review
and Compliance

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

Corps Response to Advisory Council on Historic Preservation Comments

On 22 September 1978, the District Engineer, Buffalo District, Corps of Engineers, submitted a request in regard to determinations of eligibility for inclusion in the National Register to the Keeper of the National Register. This request included documentation on the Pettit Farm, Hedgley House and Van Wagoner House. The documentation was prepared in accordance with Section 800.4 (a) of the Council's "Procedures for the Protection of Historic and Cultural Properties." The Keeper of the National Register, by letter dated 30 November 1978, determined that only the Van Wagoner House is eligible for inclusion in the National Register. In regard to the remaining steps in Section 800.4 of the Council's procedures, the District Engineer will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the remaining steps of Section 800 of the Advisory Council's Procedures (36 CFR 800) are completed prior to any approval of Department of the Army permits. Coordination letters pertaining to the issuance of this Final EIS, based on the above stipulation, may be found in Appendix E.

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

June 30, 1978

Colonel Daniel D. Ludwig, P.E.
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

We have had the draft environmental statement for the New York State Electric and Gas Corporation Proposed Cayuga Station, Somerset, New York, reviewed in the relevant agencies of the Department of Agriculture, and comments from Soil Conservation Service and Forest Service are enclosed.

Sincerely,

Barry R. Flamm

BARRY R. FLAMM
Coordinator
Office of Environmental Quality Activities

2 Enclosures

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Corps Response to U. S. Department of Agriculture Comments

21 The typographical error in the subject sentence has been corrected to read ". . . to provide for suspended solids removal. . ."

22 Section 1.060 has been modified in accordance with these statements.

23 Utilizing the data supplied by the Soil Conservation Service, we have expanded paragraph 2.053 to include the number of onsite acres of each soil type classified as prime farmland. There is no unique farmland on the site. Paragraph 4.036 has been modified to present possible effects of the station on use of onsite prime farmlands. Paragraph 5.003 has been amended to discuss effects on prime farmland soils. The addition of the FGD system will not require additional land for sludge disposal and, therefore, this project change will not result in additional impact on prime and unique farmlands. Since the FGD system is now part of the conceptual design, references to it have been deleted from Chapter 6. Paragraph 8.004 has been modified to include a discussion of irreversible and irretrievable commitment of prime farmlands.

24 Terracing is an effective method of erosion control which, although not specifically mentioned in the draft EIS, has, in fact, already been proposed for the site. Preliminary grading plans for the site indicate that the main plant area will be terraced, with the elevations stepping downward as the lake is approached. This will minimize cut and fill operations on the site, as well as facilitate drainage of the areas. Paragraph 1.060 has been expanded to include this information. The applicant in designing the transmission facility did utilize information from the NYS Department of Environmental Conservation in addition to information from the documents entitled "Environmental Criteria for Electric Transmission Lines," prepared by the U. S. Department of Agriculture and "Electric Power Transmission and the Environment" prepared by the Federal Power Commission.

SOIL CONSERVATION SERVICE - USDA
COMMENTS ON DRAFT ENVIRONMENTAL IMPACT
STATEMENT PREPARED BY U. S. ARMY
CORPS OF ENGINEERS DISTRICT
BUFFALO, NEW YORK FOR PERMIT
APPLICATION FOR PROPOSED CAYUGA
STATION, SOMERSET, NEW YORK

Page 1-38 - Paragraph entitled "Settling Basins"

21 The second sentence in this paragraph needs to be improved to bring out the intended meaning. Presumably, the intent is to use settling basins to provide for removal of suspended sediments.

Page 1-38 Section 1.060

22 This Section might better respond to erosion control concerns if it included statements that "topsoil will be salvaged, stockpiled, protected, and respread to *assist in establishment of* vegetative measures."

A statement should be added stating that disturbed areas of soil will be kept to the minimum possible and shall be promptly vegetated with suitable species of grasses, legumes, and/or plants.

Page 2-18 Land Use
Page 5-1
Page 6-35

23 These sections discuss some agricultural land uses but do not discuss whether prime and unique farmlands are impacted by the project.

We understand the Soil Conservation Service in New York provided information and data to the Buffalo District, which will allow identification of prime and unique farmlands that may be impacted by the project.

The Impact Statement should document the impacts of the project on prime and unique farmlands.

Forest Service Comments

Re: Draft Environmental Statment-N.Y.S. Electric and Gas Corporation
Proposed Cayuga Station, Somerset, N.Y.

Revegetation plans for the construction site are excellent. An increase in wildlife population will probably follow the establishment of shrub plantings. We did not find any mention of terracing as a means of erosion control.

24

Design and construction of transmission lines appear to follow New York State Environmental Guidelines for electric transmission lines, published by New York Department of Environmental Conservation. These guidelines are helpful in approaching a natural appearance. For example, deflection of right-of-way strips can be used to form irregular patterns and prevent a "tunnel" appearance.

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UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377-4745 4595

June 13, 1978

Colonel Daniel D. Ludwig
Department of the Army
Regulatory Functions Branch
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in reference to your draft environmental impact statement entitled "New York State Electric and Gas Corp., Proposed Cayuga Station Somerset, New York." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure: Memo from
NOAA-Environmental Research Laboratories

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
ENVIRONMENTAL RESEARCH LABORATORIES
Great Lakes Environmental Research Laboratory
2300 Washtenaw Avenue
Ann Arbor, Michigan 48104

June 5, 1978

TO : Dr. William Aron
Director, Office of Ecology and Conservation, EC

FROM : Dr. Eugene J. Aubert
Director, GLERL, RF24

SUBJECT: DEIS 7805.14 - Cayuga Station, New York

The subject DEIS prepared by the Corps of Engineers, Buffalo District, on the proposed Cayuga Station at Somerset, New York has been reviewed and comments herewith submitted.

The New York State Electric and Gas Corporation will use Lake Ontoraio water for the once-through cooling system of the proposed Cayuga Station at Somerset, New York. The selected site is on Lake Ontario shore extending three kilometers along the shoreline. That part of the site which will be used for powerplant facilities, including about 700 m along the shoreline, will be fenced in (Figure 1-3). A riprap embankment will be constructed along the 760 m long shoreline adjacent to the station facilities.

Zoning of the Lake Ontario shoreline in the vicinity of the proposed powerplant site is either for residential use or potential recreationway (Paragraphs 3.002 and 3.008). The Chairman of the Somerset Planning Board in his March 1, 1978 letter (Page E-5) indicated that the shoreline is one of the most valuable town assets and urged that all possible consideration be given to the establishment of guidelines which will preserve the shoreline in its natural state to the maximum extent possible. However, the Impact Statement in discussion of the land use plans concluded that the construction and operation of the proposed station would preempt all residential and commercial uses (Paragraph 3.003).

25 Review of the proposed location of powerplant facilities indicates that the exclusive use of Lake Ontario shoreline for the powerplant ignores any need and desire of the local population. The National Environmental Policy Act of 1969 requires federal agencies to "achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities." Accordingly, we believe the draft statement is inadequate because it does not consider alternatives which would preserve shoreline amenities and access. One such alternative would be to establish a buffer zone of 300 to 500 meters between Lake Ontario and the powerplant facilities. The buffer zone can be created by extending the large pipelines across that zone. As the Statement indicated (Paragraph 3.009), the Somerset Planning Board has a direct regulatory authority over the development of the project site.

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Corps Response to U. S. Department of Commerce Comments

The applicant has expressed an interest in preparing a multiple-use plan which meets local needs and retains the pastoral character of the Somerset site. In this regard, New York State Electric and Gas Corporation has agreed to prepare a report on the prospect (and, if mutually agreed upon, a multiple-use plan) if approached by community or local Government leaders.

25 An approximate 300-foot buffer zone, to be extensively planted with new vegetation, has been created between the shoreline and the power plant facilities at the western end of the site. This is about the maximum width that can be provided without having the facilities encroach upon the streams and buffer zone at the southern end of the site. A 1,000-foot buffer zone has been created at the eastern end of the site between the lake and the solid waste disposal area. The fencing around the plant facilities will not encroach into the shoreline buffer zone. Consequently, there will be no physical barrier to preclude free passage along the shoreline bluffs for the entire length of the site.

The alternative to relocate the power plant further away from the lake could result in greater impact on upland ecosystems. As discussed in Paragraph 2.155, wetlands and marshy areas exist south of the site. The proposed site itself does not include any unique habitat. Furthermore, moving the plant several miles inland would require acquisition of a considerable amount of private property whereas the proposed site is owned by the applicant.

26 Although heat input to the lake by the proposed plant would be reduced if cooling towers were incorporated into the plant design, analyses of the potential impact of the once-through cooling water discharge have indicated that impacts on the fish populations in the site vicinity will be acceptable. This level of protection has been attained through the use of specific discharge design features which protect aquatic organisms. The high velocities exclude fish from the discharge, prevent acclimation of fish to higher temperatures and speed mixing of the discharge water to near-ambient temperatures. The offshore location of the diffusion avoids the productive inshore, littoral community. Elevation of the discharge ports off the lake bottom avoids direct discharge to the near-bottom zone occupied by benthic organisms and preferred by fishes. A complete discussion of these features and the possible affects of the discharge is presented in the Application 316(a) waiver application. Reduction of thermal impacts through

In addition to the simple buffer zone, other powerplants on the Great Lakes shores, for the purpose of improving their sagging public image, are constructing recreational facilities to benefit the local population. These facilities include access roads, parking areas, boat launching ramps, fishing piers, and lakeshore swimming beaches.

26 A second choice is to relocate the powerplant further away from Lake Ontario and construct a cooling tower. Alternative cooling systems are considered on P. 6-15 - 6-18 but not in conjunction with siting further from shore. In this case, cooling water demand will be only about three to four percent of that required for the once-through cooling system. The small diameter pipelines can be extended over several miles. In addition, a cooling tower would proportionally reduce heat input into the lake and diminish the negative effects on the fish population.

27 A review should be made of the need of the 760 m long riprap embankment. That embankment was planned to prevent undermining of the plant facilities by wave and ice floe action. If, despite removal of powerplant facilities from the shoreline and the rocky character of the shoreline, such embankment still would be considered, evaluation is required on potential erosion of the downdrift shoreline.

Corps Response to U. S. Department of Commerce Comments (Cont'd)

26 the use of cooling towers would seem, therefore, to merely reduce impacts which are already acceptable.

27 The riprap revetment originally proposed for the site has been deferred until such time as the structural integrity of the power generating facilities is threatened by shoreline erosion. An erosion monitoring program will be undertaken to second the shoreline retreat at the site. Corrective action in the form of shoreline protection will take place only when proven absolutely necessary from an analysis of the erosional trends along the shoreline adjacent to the generating plant.

Department of Energy
Washington, D.C. 20545

JUL 13 1978

Col. Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Col. Ludwig:

This is in response to your transmittal dated May 3, 1978, requesting review and comment on the draft environmental impact statement entitled, "Permit Applications by New York State Electric and Gas Corporation Proposed Cayuga Station, Somerset, New York."

We have reviewed the statement, and we perceive no major adverse environmental effects that should bar construction and operation of the subject power plant. Staff comments are enclosed which you may wish to consider in the preparation of the final statement.

Sincerely,

W. H. Pennington, Director
Division of Program Review
and Coordination
Office of NEPA Affairs

Enclosure:
DOE Staff Comments

G-13

Corps Response to U. S. Department of Energy Comments

28 The applicability of various provisions of the Clean Air Act Amendments of 1977 relative to the conceptual design of the proposed facility have been determined. As of June 1978, the applicant was notified that the proposed facility has been determined to be an old source under the NSPS (New Source Performance Standards) regulations, and hence will not be subject to any new NSPS regulations promulgated under requirements of the 1977 Amendments. However, the proposed facility is subject to the new Prevention of Significant Deterioration (PSD) regulations promulgated under the requirements of the 1977 Amendments. As of July 1978, the applicant is seeking a PSD permit from EPA Region II subject to the new PSD requirements. The applicant has proposed SO_2, NO_x, and particulate emission control systems for this PSD permit application in order to satisfy the BACT (Best Available Control Technology) requirements of the new PSD regulations. The proposed BACT incorporates flue gas desulfurization with at least 80 percent SO_2 removal capability. The maximum facility emissions for the proposed BACT are 1.2 lbs $SO_2/10^6$ BTU, 0.7 lbs $NO_x/10^6$ BTU, and 0.05 lbs of particulate per 10^6 BTU.

29 Environmentally acceptable methods of power plant coal ash and FGD sludge disposal should be technologically and commercially available for satisfying any expected regulations promulgated pursuant to RCRA or TSCA. The impact of these regulations will largely be felt in increased costs and no technological problems. For example, of special interest under RCRA is the possible, and as yet unresolved, designation of coal ash and/or FGD sludge as hazardous wastes. This would have an impact on typical power plant disposal practices, not as a technological problem but as one of logistics and economics. Final regulations are not expected until early 1979.

The TSCA provides EPA with the authority to control chemical substances and mixtures which may present "an unreasonable risk of injury to health or the environment." This may include notification requirements for generation of the waste and other control type constraints. It is uncertain whether power plant solid wastes will be considered "chemical substances." However, for power plant sludges, TSCA related actions will be coordinated with the RCRA programs with the lead most likely being RCRA.

U.S. DEPARTMENT OF ENERGY STAFF COMMENTS
ON THE
U.S. ARMY CORPS OF ENGINEERS DRAFT ENVIRONMENTAL IMPACT STATEMENT
POWER APPLICATION BY NEW YORK STATE ELECTRIC AND GAS CORPORATION
CAYUGA STATION, SOMERSET, NEW YORK

General Comments

The technical specifications for the proposed plant are not well defined. No doubt this situation results from the current uncertainty of the evolving NSPS for power plants as a result of the 1977 Federal Clean Air Amendments.

28 The EIS describes a plant based on meeting current NSPS, e.g., low sulfur coal feedstock, advanced fire box design for NO_x control and a high efficiency ESP for particulates. In Section 4.195, it is stated that "the plant may require additional control measures under Federal Clean Air Act Amendments of 1977." The proposed plant will require enhanced controls which will significantly alter the tentative design. While these controls (in particular FGD and bag-houses) have been presented as options, they are likely to be required. The EIS confirms the critical and timely need for constructing the reference plant. It would seem in the best public interest that a *hiatus due to uncertainty in environmental compliance standards* be avoided. The issue of this uncertainty and its impact should be addressed.

With the hardening of environmental standards and design specifications, some areas of concern might be singled out. For example:

29 The environmentally acceptable disposal of power plant ash and sludges (FGD and water treatment) in light of impending TSCA and RCRA constraints.

30 The parasitic energy and resource expenditure associated with the sulfur and particulates control systems ultimately selected.

Specific Comments Follow:

31 In site selection and design of a coal-fired facility, coal fuel stocks are one of the first considerations. This facility proposes to use 3 million tons per year of low sulfur eastern or western compliance coal or 2-2.5 million tons of high sulfur coal without a specific source being identified or selected. This may result in some design or procurement problems at a later date unless the project is in a preliminary planning phase at this time.

32 Page 6-26 - The fluidized bed alternative description is incorrect in the statement, "...particles of limestone supported by a nonshifting grid..." Current designs have the limestone fluidized in the coal during combustion process.

Corps Response to U. S. Department of Energy Comments (Cont'd)

30 Electrical requirements of the Cayuga Station FGD system and the electrostatic precipitators are estimated at 18,000 KW and 10,000 KW, respectively, for a total of 28,000 KW. This represents a "parasitic energy expenditure" of approximately 3.3 percent of the maximum net station generating capacity. The FGD system will also require 250,000 tons of limestone each year and 60,000 gallons of water per hour.

In determining the control system most appropriate for use at the Cayuga Station, the factors mentioned in Comments 29 and 30 (resource consumption, parasitic energy requirements, available technology) were balanced against the environmental benefits to be derived from this type of control system. The applicant ultimately selected the system discussed in Chapter One of this EIS as an equitable balance of all factors considered.

31 The applicant has purchased the stream generator for this facility from Babcock & Wilcox. It is designed to burn a wide range of bituminous coals. The applicant is planning to use high sulfur coal in conjunction with a FGD system to comply with NSPS for SO_2 emissions. The applicant currently is in the process of procuring fuel for this facility and foresees no difficulty in obtaining adequate supplies of suitable coal. Chapter One identifies the most likely sources of coal.

32 Paragraph 6.089 has been modified to reflect the more current design.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
107 DELAWARE AVE., STATLER BLDG., SUITE 000
BUFFALO, NEW YORK 14202

REGION II
26 Federal Plaza
New York, New York 10007

April 27, 1978

IN REPLY REFER TO:
2.2CM/RM

Daniel D. Ludwig, P. E.
Colonel
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Subject: Draft Environmental Impact Statement, New York State Electric and Gas Corp., Cooling Water Intake and Discharge System in Lake Ontario

Please be advised that we do not have comments at this time regarding subject project.

Sincerely,

for James Patterson
Frank D. Carabone
Area Director

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 78/401

JUL 6 1978

Daniel D. Ludwig, PE
Colonel, Corps of Engineers
District Engineer
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Thank you for your letter of May 3, 1978, transmitting copies of the draft environmental statement (permit application) for the proposed 850 MW coal-fired steam electric Cayuga Station, Niagara County, New York.

Our comments are presented according to the format of the statement or by subject.

General

We find the draft statement to be inadequate in its discussion of fish and wildlife resources at the Somerset site. The analysis of these resources comes from an inadequate or inappropriate data base. This is due to insufficient data collection or to the use of data gathered elsewhere in Lake Ontario and extrapolated to the Somerset site. 33

In addition, the draft statement does not adequately address the potential impacts of the proposed project to fish and wildlife resources. Particularly important is the lack of consideration for the potential cumulative impact the Somerset station may have on Lake Ontario when combined with the impacts of other similar uses of the Lake. Furthermore, an adequate assessment of alternatives to a once-through cooling system has not been presented. 34

Indian Trust Lands

We find that the proposed project does not directly impact any Indian trust lands under the Department's jurisdiction.

G-16

Corps Response to U. S. Department of the Interior Comments

To insure that the specific concerns raised in this comment were adequately addressed, Corps staff met with representatives of the U. S. Fish and Wildlife Service, Cortland, NY, on 18 July 1978. The meeting was held to clarify issues conveyed in the U. S. Department of the Interior letter of comment and to reach an understanding by which staff would address these concerns. A copy of the meeting minutes and associated correspondence are presented in Chapter Nine of this final EIS.

33 The applicant conducted an additional year of aquatic studies in 1977. The extended data based from these studies supports the conclusions presented in the draft EIS regarding the selection and design of the intake and discharge system. Despite differences between the sampling program in 1977 and that in 1974-75, data indicates generally consistent fish species composition and spatial distribution trends. Paragraphs 2.248 through 2.254a and Table 2-22 have been updated to include the results of the 1977 data. The information in Table 2-23, which was a summary of Table 2-22, has been replaced with information comparing 1975 and 1977 gill net catches.

Additional baseline information from the 1977 sampling program has been forwarded to the U. S. Fish and Wildlife Service. Paragraph 4.139 has been expanded to include comparison of Somerset and Nine Mile Point (NMP) catches to justify use of NMP data for impingement estimates at Somerset. Table 4-7a has been added to present this comparison. Additional information from 1977 studies has been added to the Terrestrial Ecology section of Chapter Two and Table 2-30 has has been revised to include 1977 data.

34 The sentence ". . . the draft statement does not adequately address the potential impacts of the proposed project to fish and wildlife resources" refers to the specific concerns conveyed in the remainder of the Department of the Interior letter of comment. A discussion of the potential cumulative impact of the Cayuga Station on Lake Ontario when combined with the impacts of other similar uses has been added to the EIS (Paragraph 4.142a). Alternative cooling systems are discussed in the Corps response to comment No. 50.

35 A new section, 2.168a, which addresses water elevations during storm conditions, has been added to the EIS. The grade adjacent to the shore will be raised to approximately elevation 259 feet (IGLD, 1955) in conjunction with plant construction, and thus flooding is not expected to occur during storms.

Hydrology

35 Since the elevation of the proposed site ranges from about 5 to 50 feet higher than the normal water level of Lake Ontario, storm-generated waves occurring during a several-day storm may cause inundation of the lower elevations of the site. The frequency and magnitude of such flooding should be fully assessed in the final statement.

Cultural Resources

36 The draft statement identifies several historic sites in the vicinity of the proposed project which might meet the criteria for nomination to the National Register of Historic Places. For all these properties that may meet the criteria, we recommend that the project sponsor should request a determination of eligibility for inclusion in the National Register from the Keeper of the National Register. Regulations concerning requests for determinations of eligibility (36 CFR 63) were published in the Federal Register on September 21, 1977.

The final statement should describe the nature and the extent of the effect and the steps being taken to comply with Section 106 of the National Historic Preservation Act and Sections 1(3) and 2(b) of Executive Order 11593, if any properties listed in or eligible for the National Register will be affected by the project.

Geology and Mineral Resources

37 The geology and mineral resources in the project area are adequately discussed in the draft statement. Although we have not conducted an onsite study of the area, the Bureau of Mines MILS files indicate no mineral production within the proposed plantsite. However, the proposed transmission lines would pass in the vicinity of a stone quarry near Gasport, New York. Any adverse impact on the quarry operations resulting from the location of the transmission lines should be discussed in the final report. Power from the proposed plant may be beneficial to the mineral industry of the area.

Corps Response to U. S. Department of the Interior Comments

36 On 22 September 1978, the Corps submitted requests for determinations of eligibility to the Keeper of the National Register. The Corps, along with the request, transmitted the appropriate documentation on the Pettit Farm, Badgley House and Van Wagoner House. The Keeper of the National Register, by letter dated 30 November 1978, advised that only the Van Wagoner House is eligible for inclusion in the National Register. Prior to any approval of Department of the Army permits, the Corps will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the remaining steps of Section 800 of the Advisory Council on Historic Preservation Procedures (36 CFR 800), are completed. Correspondence concerning this matter is contained in Appendix E. Additionally, section of Chapter 4 pertaining to cultural resources have been updated to include the above information.

37 The closest stone quarries are approximately 1.5 miles east of Gasport and greater than two miles east of the proposed route. The proposed transmission lines will have no effect on the operation of these quarries.

Since the preparation of the draft Environmental Impact Statement, the applicant has decided to use high sulfur coal and install a flue gas desulfurization system to control sulfur dioxide emissions. Thus, any further discussion of low sulfur coal is unnecessary.

38 The final method of rail transportation of coal to Somerset Station is still under investigation and a preferred route will not be selected until after fall 1978, at the earliest. At that time, an environmental report will be filed with appropriate Federal and/or State agencies and the licensing process will commence. It is anticipated the final approval of a railroad route will not be forthcoming until mid to late 1979.

Among the alternate methods considered for transporting coal to the Somerset site were barge, truck, slurry pipeline and conveyor. All were rejected for economic or operational considerations.

39 The sections in Chapter One pertaining to solid waste disposal have been revised in accordance with concerns raised in this comment and comments from the USEPA (refer to Comments 10 through 19). The applicant intends to install a flue gas desulfurization system. Sludge generated by the FGD system will be dewatered, mixed with fly ash, and stabilized. The stabilized FGD sludge is essentially impermeable (10^{-6} to 10^{-8} cm/sec) and will be used as a liner for solid waste disposal areas. Revised Paragraph 1.090 discusses disposal and containment of dredged material. Updated presentations on solid waste disposal are found in Paragraphs 1.089 through 1.114.

40 The ash/FGD sludge material is relatively inert when stabilized and has low permeability and leaching characteristics. It will be covered with about 24 inches of topsoil and revegetated by the

Fuel Source

38 The final statement should identify both plans for low sulfur and high sulfur coal transportation to the Somerset site and adequately assess the impacts of alternative coal transport methods.

Ash and Dredge Spoil Disposal

39 We find that the draft statement does not adequately address the impacts and containment measures for the large quantities of dredge spoils, fly ash, bottom ash, and pyrites that will accumulate. For ash fill, the draft statement indicates in Section 1.085 that an impervious layer will be established before deposition; however, in Section 1.110, it is indicated that an impervious layer for the ash disposal area will be used "if needed." These two conflicting discussions should be reconciled in the final statement. The final statement should provide a discussion of criteria to be used to make a determination of "need," including soil parameters and groundwater characteristics at chosen disposal sites.

40 The draft statement indicates in Section 1.110 that it is planned to cover the ash disposal site with reserved topsoil "capable of supporting vegetation." Due to the toxic nature of the proposed spoil material, we believe that revegetation may be quite difficult. We suggest the final statement consider two plans of action that might be followed: (a) natural succession may be allowed to occur, or (b) artificial revegetation may be used. If natural succession is used, any erosion potential must be eliminated until vegetation is established. If revegetation is attempted, careful selection of appropriate species must be made to ensure some measure of success.

41 In the general site description in Section 2.155 of the draft statement, it is indicated that run-off is slow, that drainage problems exist throughout the area, and that marshy areas are common. However, no indication was given in the draft statement as to how these topographic features will affect groundwater and surface water hydrology. The extent that wildlife species use these areas, as well as the impacts of filling operations and containment of toxic ash and spoil materials should be considered in the final statement.

Corps Response to U. S. Department of Interior Comments (Cont'd)

40 applicant. Paragraph 1.110 has been expanded to include this information, and to discuss the revegetation measures in greater detail. After reviewing the applicant's proposal, research efforts by Dravo Company, I.U. Conversion Systems, Inc., and Bureau of Mines Information Circular (IC 8640, 1974), Corps staff believes that careful selection of plant species will ensure successful revegetation.

41 The statement in Paragraph 2.155 of the draft EIS pertaining to slow runoff and poor drainage referred to characteristics of the general site vicinity but not the site itself. Additionally, there are no marshy areas on the site although south of the site wooded wetlands exist. Paragraph 2.155 has been amended to clarify these points.

42 An onsite upland disposal area has been designated and is described in Paragraph 1.090 and shown in Figure 1-11.

43 The bald eagle sighting was part of a year-long study. The primary effort of this study was to determine the status of threatened and endangered species in the site vicinity.

The bald eagle was sighted only once during the study and no other threatened or endangered species were observed. The study was of sufficient detail to be termed "in-depth." Paragraphs 2.316 and 2.317 have been modified to address this comment.

44 A discussion of the impact that the removal by entrainment and impingement of fish and ichthyoplankton may have on food chains of the lake has been added to the EIS in new section 4.158a.

45 Only economically important insects were studied in detail by the applicant, although many other species were observed. Project impacts on insect populations and the food chain are not expected to be significant. Paragraph 2.307 has been rewritten to clarify these points.

46 The New York State Department of Environmental Conservation has no recent hunter use figures for the Somerset area. However, hunter use is low in the general area due to declining pheasant populations. There is little land in the site area open for hunting and no land onsite is open for hunting. Paragraph 2.305 has been revised to indicate the above, and hunter use estimates from the Regional Wildlife Manager (NYSDEC) have been added. Impacts on the subject species are identified in Paragraphs 4.007 and 4.010.

47 The final methodology for netting or dispelling fish from the blasting area has not yet been determined. The applicant intends to meet with representatives of the New York State Department of Public Service and New York State Department of Environmental Conservation to assess the feasibility of different methods. A discussion of possible netting methodology has been added to Paragraph 4.033.

We note that dredge material to be removed from Lake Ontario has been found to be moderately polluted. No upland disposal site has yet been identified for this material. Until such a site
42 is chosen, it cannot be determined what impact the spoils may have and the mitigation measures needed to ensure maintenance of environmental quality. We believe that the final statement should at least identify alternative disposal sites under consideration and provide an adequate assessment of the environmental impacts of dredge spoil disposal at each site.

Endangered Species

A sighting of one bald eagle was recorded in Section 2.317 of the draft statement and it was assumed to be a transient. However, no further field observations were made to determine if this was true, or if other bald eagles were in the area, or
43 using the resources of the proposed Somerset plant site. Bald eagles may not nest on the site, but if they are present in the area, site activities may have an impact on any further usage. *The final statement should provide an in-depth study to ascertain* if any threatened or endangered fauna are on or near the site to substantiate the use of words such as "unlikely," "could occur," and "may occur" in Section 2.318 through 2.320 of the draft statement.

Fish and Wildlife Resources

Fish and icthyoplankton mortality that may be caused by entrainment and impingement are judged only by the effect that their mortality will have on adult population dynamics in
44 Section 4.157 and Table 4-13 of the draft statement. The final statement should contain a discussion of the impact that the removal of fish and icthyoplankton may have on food chains of the lake.

We note that the only insect populations considered in Section 2.307 of the draft statement were those classified by
45 man as pests. Other insects present and project impacts on these populations or on other members of the food chain should be described in the final statement.

Section 2.305 of the draft statement indicates that American Woodcock and Ring-necked Pheasant occur on the site. In fact,
46 Somerset lies within excellent pheasant range in New York and the range at the site is considered to be good. No hunter-use

Corps Response to U. S. Department of Interior Comments (Cont'd)

The sulfur removal systems discussed in Sections 6.089 through 6.128 and in Appendix D of the draft EIS are those considered most feasible for the proposed Cayuga Station. These systems include fluidized bed combustion, and both regenerative and nonregenerative flue gas desulfurization (FGD) systems. Essentially, the detailed analysis was restricted to a nonregenerative FGD system since this is the preferred alternative for the station. High sulfur coal was chosen for the analysis since it represented a worst case. Subsequent to the issuance of the draft EIS and as a consequence of revised Prevention of Significant Deterioration requirements, the facility conceptual design was changed to include, among other
48 things, flue gas desulfurization in conjunction with the burning of high sulfur coal. Basically, the information on FGD which was presented in Chapter 6 and Appendix D has been incorporated, with some expansion, into the appropriate chapters of this final EIS. Thus, the impact statement now describes the proposed methodology for sulfur removal for the proposed high sulfur coal and addresses the related environmental impacts. Chapter Six of the final EIS retains the discussion on fluidized bed combustion and includes an expanded section on regenerable FGD systems. Paragraph 1.030 has been revised to include a more detailed description of the electrostatic precipitators.

49 An expanded discussion on regenerative type FGD systems is presented in Sections 6.090 through 6.097.

The essential question raised in this comment is the acceptability of the applicant's 316(a) demonstration and 316(b) studies in accordance with provisions established in Section 402 of the Federal Water Pollution Control Act Amendments of 1972. Section 316(a) allows the USEPA and authorized States, such as New York State, the authority to modify the effluent limitation for the thermal component of the effluent if the applicant can demonstrate that the limitation is more restrictive than needed to maintain and sustain a balanced indigenous population of fish, shell fish, and wildlife communities and populations in or on the receiving
50 water body. Section 316(b) requires that the location, design, construction, and capacity of cooling water intake structures reflect the best available technology for minimizing adverse environmental impact. At Somerset, both the Public Service Commission (NYSPSC) the New York State Department of Environmental Conservation (NYSDEC) and the Examiners in the Article VIII case have concluded that the 316(a) demonstration is acceptable and that cooling towers would be excessive mitigation in regard to the thermal component of the discharge for the proposed Cayuga Station at Somerset. The Examiners and Public Service Commission

48 data is presented for the proposed plant site nor is any assessment made of the impact that construction would have on game bird populations, their habitat, and hunting effort. The final statement should provide an adequate assessment of these potential impacts on both wildlife resources and recreational opportunities.

47 It is proposed in the draft statement that prior to blasting operations in Lake Ontario, the work area will be netted off to exclude fish or that fish will be dispelled from the area. More information is required in the final statement to describe the methods to be used for accomplishing such netting or dispelling.

Stack Gas Cleaning

48 The draft statement does not identify any proposed sulfur removal process for stack gas cleaning for either the use of high or low sulfur coal. The final statement should fully describe proposed methodology for sulfur removal for either type coal source and adequately evaluate the environmental impacts associated with the process. In addition, a more detailed description of the proposed operational characteristics of electrostatic precipitators should be supplied in the final statement.

49 A large segment in the alternatives chapter is devoted to a discussion of Flue Gas Desulfurization (FGD). Using such a system would expand the area needed for waste disposal. Regenerative scrubbers are available and their potential for use at this plant should be fully evaluated in the final statement.

Alternatives

50 Alternatives to the planned once-through cooling system were superficially discussed in the draft statement. Federal law clearly mandates that unless the applicant can successfully prove that once-through cooling is the only acceptable alternative, cooling towers must be fully considered. A further study of the impact of cooling towers, especially of the natural draft variety, is needed. An item of particular concern would be the impact of cooling towers on the bird migration routes in the area. In addition to being an area of hawk migrations, the proposed plant area is also within the flyway of a great many waterfowl. Iroquois National Wildlife Refuge, located approximately 50 miles to the southeast, is a resting and feeding ground for many of these birds.

Corps Response to U. S. Department of the Interior (Cont'd)

have also found that the intake and cooling system design demonstrates best available control technology for minimizing adverse effects. The NYSDEC does not completely accept the 316(b) studies, making certain recommendations regarding the height of the intake ports from the lake bottom and distance from shore, and alternative fish return systems. However, the NYSDEC has not recommended cooling towers at Somerset. The USEPA commented on the draft 402 discharge permit on 2 February 1978. As stated in the EPA letter of comment "EPA is in agreement with the cooling 50 water system requirements as contained in the draft permit for both Cayuga and Somerset." In regard to the 316(b) demonstration, the USEPA concurred that "cooling towers appear to be an excessive mitigation." The final decision regarding the cooling water system will be made at a later date by the New York State Board on Electric Generation Siting and the Environment. The final decision is subject to approval by the USEPA. Corps staff is in agreement with the USEPA, NYSDEC, and NYSPSC that cooling towers do not appear to be warranted for the Cayuga Station at Somerset.

Natural draft cooling towers are discussed in Section 6.059 of the final EIS. A new section, 6.066a, describing the impact of cooling towers on migrating birds has been added to the EIS. The major reasons for selection of the once-through system over cooling towers are presented in Paragraph 6.067 which has been amended.

51 This comment summarizes the specific concerns conveyed in the previous comments.

The U. S. Fish and Wildlife Service is advised that Paragraphs 1.046, 1.049, and 1.050 describe the work being considered under Department of the Army Permit Application No. 76-484-29. In response to the Corps 13 April 1977 public notice describing the work, the U. S. Fish and Wildlife Service declined comment until 51A completion of the NEPA statement. The only project change which has occurred in the application since issuance of the public notices, is that the applicant has withdrawn the request for authorization of shore protection. Department of the Army permits, if issued for the proposed work, would authorize dredging and the placement of intake and discharge structures with associated pipelines and backfill, but would not authorize the operation of the cooling system. The type of system ultimately selected and the operational and monitoring aspects will be certified by the New York State Siting Board, subject to USEPA consent. The U. S. Fish and Wildlife Service is invited to submit comments on the permit application after review of the final EIS.

Fish and Wildlife Coordination

S1 As noted in the draft statement, Federal actions associated with this project include issuance by the Corps of Engineers of a permit under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act of 1972. The draft statement does not adequately describe the existing fish and wildlife resources or evaluate project construction impacts.

S1A Our comments on the draft statement in no way preclude additional and separate evaluation and comments by the U.S. Fish and Wildlife Service pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.). However, based on the available information, the Fish and Wildlife Service has serious reservations about the project because of its potential adverse impacts on fish and wildlife resources. The Service may oppose the installation of intake and effluent structures in Lake Ontario unless convincing arguments can be advanced in favor of once-through cooling.

We hope these comments will be helpful to you in the preparation of a final statement.

Sincerely,

Larry E. Meierotto
Deputy Secretary SECRETARY

DEPARTMENT OF TRANSPORTATION
SAINT LAWRENCE SEAWAY DEVELOPMENT CORPORATION
WASHINGTON, D.C. 20591 MASSENA, NEW YORK 13662

May 17, 1978

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207
Attention: Regulatory Functions Branch

Dear Colonel Ludwig:

Reference is made to your 3 May 1978 Draft EIS entitled "Permit Application by New York State Electric and Gas Corporation Proposed Cayuga Station, Somerset, New York."

SLSDC has reviewed the statement as it pertains to our areas of expertise. No comments are offered at this time.

The opportunity to comment is appreciated. Please forward a copy of the Final EIS when it becomes available.

Sincerely,

Clarke F. Dilks
Chief, Environmental Planning

G-22

UNITED STATES OF AMERICA
GENERAL SERVICES ADMINISTRATION

Public Buildings Service
Washington, D.C. 20405

MAY 22 1978

Colonel Daniel D. Ludwig, P.E.
Buffalo District, Corps of Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The General Services Administration has reviewed the draft environmental impact statement for the Proposed New York State Electric and Gas Corporation, Cayuga Station, Somerset, New York, and have no substantive comments to make.

Thank you for the opportunity to comment.

Sincerely,

ANDREW E. KAUDERS
Environmental Affairs Division

G-23

Keep Freedom in Your Future With U.S. Savings Bonds

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (map)
Ninth Coast Guard District
1240 East 9th St.
Cleveland, Ohio 44199
Phone: 216-522-3919

*16475

JUN 19 1978

*Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Re: 3 May 1978 ltr concerning NCBCO-S 76-484-29 New York State Electric & Gas Corporation, Draft Environmental Impact Statement

Dear Sirs:

S2 This office has reviewed the referenced statement and requests that paragraph 1.039 on page 1-26 be more specific concerning the containment dike around the 150,000 gallon fuel tank. The dike should be able to contain all of the 150,000 stored gallons in the event that a spill of such magnitude occurred.

Sincerely,

[redacted]
Captain, U.S. Coast Guard
Chief, Marine Safety Division
By direction of the Commander,
Ninth Coast Guard District

G-24

Corps Response to U. S. Department of Transportation - U. S. Coast Guard Comments

S2 The applicant has designed the dike system around the fuel oil storage area so that it is large enough to contain all of the 150,000 gallons of stored oil in the event of a spill. Paragraph 1.039 has been amended to indicate this fact.

2.327, 3.010, 4.066 through 4.096.

We recommend removal of any substantive discussion on routes and their likely impacts. However, the generalized discussion of impacts associated with operation and maintenance of transmission lines (§4.283-4.299) may be retained unmodified. 53

2. The Pond and Woodlands on the Proposed Site

The Applicant has agreed by stipulation 79-7 in Case 80002 to protect and preserve if at all possible the pond and associated woodlands in the northeast corner of the Somerset site. Further, Applicant agreed that FGD scrubber wastes may be accommodated in the area originally set aside for ash disposal. This will require piling the materials to a depth of about 75 feet rather than 60 feet. This was considered acceptable by the Applicant, and desirable by the Department of Environmental Conservation. Therefore §6.119 should be modified to reflect these final agreements. (A copy stipulation 79-7 is attached hereto.) 54

3. Agricultural Districts

On p. 3-2 and 3-3 regarding State Land Use Plans, no mention is made of the New York State designated Agricultural District Number surrounding the Somerset site. Since this land use designation defines particular agricultural areas, and provides special tax and other administrative benefits, the District must be reflected. In fact its presence influenced judgment of acceptability of on-site versus off-side solid waste disposal in State Case 80002. 55

4. Terrestrial and Aquatic Ecology

a. In §4.004, paragraph two should reflect the expectation that no species or population is expected to be endangered. 56

Corps Response to NYSDEC Comments (Cont'd)

70 the applicant now agrees to onsite disposal exclusively and this disposal area will be diked and lined with an impermeable material. The appropriate changes have been made in Paragraph 1.090.

71 The second sentence of Paragraph 1.112 regarding samples of influent and effluent pertains to a surface water monitoring program in addition to the groundwater sampling described in the first sentence. The final EIS clarifies this point.

72 The precautions mentioned in this comment have been added to the EIS (Paragraph 1.097).

73 Table 1-28 has been modified to indicate that 316(a) pertains to the thermal component of the discharge and 316(b) pertains to the intake structure's construction, location, design, and capacity.

74 The summary has been amended to read "18 acres."

75 The appropriate additions have been made to Table 4-15.

76 The term "cooling tower evaporation" has been eliminated from Paragraph 5.013.

77 Appendix D has been incorporated into the text of the FEIS. Stabilized sludge disposal site runoff treatment is discussed in Paragraphs 1.085-1.087.

78 The proposal to install shoreline protection has been withdrawn by the applicant. Corps staff did not endorse the proposed shoreline protection in Paragraph 1.045 of the draft EIS but rather described the proposal and its intended purpose. However, in areas of serious erosion, staff generally does prefer the installation of riprap-type structures which are properly designed and do not extend into the waterway to any great degree. Riprap provides habitat for aquatic organisms and unlike devices such as bulkheads tends to absorb rather than reflect wave energies, thereby reducing reflected wave impacts on adjacent shoreline areas. Additionally, by limiting the lakeward extension of riprap, accretion will not be great enough to result in downdrift starvation and damage to adjacent shoreline areas.

79 The description of the Queenston Formation as a ". . . fine to very fine grained, fairly competent sandstone" is not solely based on outcrops along the shoreline. Rather, the description is primarily based on an extensive geologic investigation undertaken for

b. In §4.136 the use of the term, "thermal tolerance" is misleading, if not incorrect as used. We suggest replacing with "maximum body temperature." 57

c. In §4.137, line 7, after "swimming speed," add before the "and" "behavioral responses to intake water currents,". 58

d. In §4.142 and other locations, "(Schneider, 1977)" is cited, but does not occur in the References section. The bibliographic citation should be: Schneider, C.F., 1977, "Preliminary Biomass Estimates for Demersal Portion of Alewife, Rainbow Smelt, and Slimy Sculpin Stocks in New York's Waters of Lake Ontario." Lake Ontario GLFC March 1977 App. No. VII. 59

5. As to matters of Air Quality, set forth under "Atmospheric Discharges" in the DEIS, we submit the following comments:

a. Page 1-84, Table 1-20 - Footnote (c) applies to the opacity standard but is not shown in table. 60

b. Page 1-85, Section 1.127 - The maximum firing rate for each auxiliary boiler is 1.93×10^8 BTU per hr. and not 1.93×10^9 BTU per hr. 61

c. Footnote (a) does not apply to the nitrogen oxides standard. Also, footnote (b) is not shown in the Table. It applies to the particulate standard. 62

d. On page 1-89, radioactivity of emissions is predicted by assuming a particulate stack emission rate of 6.05 kilograms (13.3 pounds) per million BTU. Why assume this high emission rate when standard is only 0.1 pounds per million BTU. The 6.05 63

Corps Response to NYSDEC Comments (Cont'd)

an Article VIII Application to the NYS Board on Electric Generation Siting and Environment. Part 76-S of that Application is concerned specifically with the geology of the Somerset Site.

Shales do occur in the Formation at the site, but only in thin interbedded layers, and not of a 1,000-foot thickness, as may be found at other locations in the region. 79

Since the rock at the site is primarily a competent sandstone, no problems such as deterioration in open excavations are expected. Additionally there is no evidence to suggest that there will be any problems due to residual stresses in the rock at the site. During the exploratory boring program there were no occurrences of bore holes closing or reshaping, or of discing of the core samples. Also, no small scale pop-ups were observed in the outcrops along the shoreline.

Paragraph 2.120 has been expanded to include a more detailed description concerning the division of the geological regime especially as it pertains to groundwater.

A slight showing of methane gas did occur in several of the deep borings drilled at the site. However, this gas was encountered at a considerable depth into the rock. Since none of the foundations for the generating facilities will require excavations to the depth at which the gas was found, no problems with encountering gas pockets is expected. The potential of the gas migrating upward into the excavation is remote, but provisions will be made to observe the deeper excavations for any evidence of methane. If it is found to be a problem, proper provisions will be made by the applicant for its removal. However, this event is highly unlikely. 80

kilograms probably refers to estimated ash content of coal. 83 How does this relate to radioactivity emissions? This should be clarified.

e. Page 1-90, line 9 - (11,940 BTU per lb.) should 84 replace (11.940 BTU per lb.)

f. The N.Y.S. Ambient Air Quality Standards were modified in March of 1977 as noted in Table 4-17. The text 85 on p. 4-72 and tables 2-13 and 2-14 should be changed to reflect these changes.

g. Certain assumptions made in the calculation of Lake Breeze fumigation should be reviewed. a. The mean wind speed $\bar{u}$ assumed was 4 meters/second, a lighter wind speed (up to 2 meters/second) could have reasonably been assumed. b. The net rate of sensible heating of an air column by solar radiation, R ($cal/m^2/sec$) is greater than may be expected to persist over a 3 hour period. 86 A value of 110 versus the 140 assumed appears more reasonable. c. Maximum impact is assumed to occur when the total plume ($h_e + 25$) is fumigated. However, due to the rate of growth of the TIBL maximum concentration may occur when only part of the plume is fumigated. d. The lapse rate assumed for stable onshore flow ($\partial\theta/\partial z$) is small (.007°c/m). It is reasonable to assume a larger value (.02°c/m).

6. Water Quality and Waste Disposal

In Case 80002 certain stipulations were entered into by the Applicant in respect to water quality and liquid waste treatment. Certain points in the DEIS require modification in light of these stipulations. All stipulations

referring to issues of water quality and liquid waste are attached hereto for reference by the Corps:

a. §1.061 - Liquid Wastes does not indicate that lubricant, oil and chemical storage areas will be sealed with impermeable materials and designed to contain the 10 year - 24 hour runoff as well as spills equivalent to the full volume of stored materials. (See stipulation 80-12). Chapter I does not describe excavation dewatering flow treatment, either (See stipulation 80-9). 67

b. §1.070 - Yard Drainage from Potentially Contaminated Areas discusses that runoff from ash handling, electrostatic precipitator and coal car unloading areas will be directed to the Drainage From Contaminated Yard Area Treatment Facilities, when in fact, it goes to the Coal Pile Drainage Treatment System (Stipulations 80-13 and 80-17). 68

c. § 1.080 - Coal Pile Runoff mentions there are three (3) settling basins which will receive coal pile drainage. However, whereas it is stated that the coal pile will be placed on an impervious surface, nothing is said about those three basins or the coal car unloading area being lined. 69

d. § 1.090 - Dredged Material and Excavation Wastes states that several offsite areas are being considered for disposal of dredge spoil. Applicant, however, stipulated to the disposal of this material at an onsite area. Similarly, no reference is made to the fact that this particular area will be sealed with an impermeable liner (Stipulation 80-11). 70

e. § 1.112 - Monitoring of Ground Water Quality at the Disposal Area: Instead of describing the use 71

71 of upstream and downstream wells for monitoring groundwater quality, it is stated that samples will be taken of the influent to and of the effluent from the sedimentation ponds. This seems to be more related to the monitoring of runoff discharges than to groundwater monitoring.

f. Other aspects of the stipulations, such as lining

72 of (a) the transformer area; (b) fuel storage facilities during operation; (c) building floor and equipment drainage settling basins; (d) bottom ash handling system settling and recirculating basins; were not addressed in the DEIS.

In addition to foregoing points regarding the Stipulations in Case 80002 DEC submits the following Comments as to these matters:

a. Table 1-30 on page 1-104 gives the impression

73 that a 316(b) is only needed if a once-through cooling system is used. This table should be modified to clearly indicate that a 316(b) demonstration applies to both types of cooling system, any time the construction of an intake structure is proposed.

b. The size of the 3° F mixing zone is given in

74 Sections 1.147 and 1.148 of Chapter I as "18 acres," whereas on page "iii" of the DEIS summary that size appears as "15 acres". The first figure is the correct one, namely "18 acres".

c. Table 4-15 on page 4-65 lists all federal effluent

75 limitations, guidelines and standards for pollutants other than heat. This table is missing 40 CFR 423.15(a), (b),(i), and (j) of the federal rules and regulations.

d. § 5.013 on page 5-3 makes a reference to cooling

76

76 tower evaporation. Obviously this statement should be deleted.

e. On page D-7 of Appendix D: - FGD System Conceptual Design, the stabilized sludge disposal site development and operation is described. Section D.027 on
77 page D - 9 seems to be incomplete as to potential treatment requirements for disposal site discharges. Appendix D should be expanded to explain the type of treatment that contaminated runoff will be given.

7. Geology

In respect to areas of geological concern included in the DEIS, we find that the overall issue of the impact of the proposed plant to have been adequately covered. Clarification of certain items are required, however:

a. § 1.045 Shoreline Protection - Although a means of protecting the shoreline immediately adjacent to the plant site has been devised which the Corps apparently considers adequate, has any consideration been given to the long term effects of the shoreline modification and riprap placement on the adjacent natural beaches
78 east and west of the protected zone?
Often an alteration of section of beach will result in unplanned deposition or erosion rate changes of the adjacent beaches due primarily to changes in longshore current flow. There is no indication that this potential environmental impact has been considered in this case.

b. § 2.109 The Queenston Formation, which underlies the site, is described as a "...fine to very fine grained, fairly competent sandstone." This description is based

upon outcrops occurring along the Lake Ontario shoreline. The Queenston Formation in the Rochester-Buffalo area is over 1000 feet thick and is usually described as red shales and siltstones with interbedded sandstones and shaley dolomites. Many of the Queenston shaley beds deteriorate rapidly when exposed in open excavations. Is it possible that the sandstone outcrops occurring along the lake shore are merely one more resistant bed within a more typical shale which does not outcrop, yet may represent the bedrock underlying the site?

79 No mention is made of the residual stress problem which commonly affects rock excavation projects in the Buffalo-Niagara Falls area, causing pop-ups and sudden wall closures during construction projects.

c. § 2.120 and 2.121 Groundwater - The division of the geologic regime into "overburden, uppermost bedrock, and main bedrock mass" is very confusing and needs to be clarified. In any event, I am certain that the "lower main bedrock" is not "made up of several isolated joint systems" as is stated in the report, but more likely

80 contains several joint systems.

Experience in the Queenston Formation in this area indicates that methane gas occasionally contained in bedding plane seams can migrate upward along high angle fractures. For that reason, it is possible that methane gas may be encountered during foundation excavations in bedrock, if any are planned.

G-33

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
ALBANY, NEW YORK 12234

NEW YORK STATE MUSEUM AND SCIENCE SERVICE

ANTHROPOLOGICAL SURVEY

May 9, 1978

Mr. Daniel D. Ludwig, P.E.
Colonel, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Ludwig,

RE: 76-484-29
Somerset Station
N.Y.S.E.G.

I appreciate the opportunity to review the Draft Environmental Impact Statement for the proposed project above.

It appears that adequate attention has been given to archeological resources, and that no impact will result from construction on the primary site. If the alternate is chosen, I understand further survey will be required.

Please include this office in future distributions for comment of archeological reports and other documents pertaining to archeological resources.

Sincerely yours,

ROBERT E. FUNK
State Archeologist

G-34

STATE OF NEW YORK DEPARTMENT OF PUBLIC SERVICE

EMPIRE STATE PLAZA, ALBANY 12223

PUBLIC SERVICE COMMISSION
CHARLES A. ZIELINSKI
Chairman
EDWARD P. LARKIN
CARMEL CARRINGTON MARR
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KAREN S. BURSTEIN

PETER H. SCHIFF
General Counsel
SAMUEL R. MADISON
Secretary

May 12, 1978

Daniel D. Ludwig, P.E.
Colonel, Corps of Engineers
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Your Reference: 76-484-29
Our Reference: Case No. 80002
Applicant: New York State Electric & Gas Corporation

Dear Colonel Ludwig:

This will acknowledge receipt of your letter dated May 3, 1978, enclosing the Draft Environmental Impact Statement entitled "Permit Application by New York State Electric and Gas Corporation Proposed Cayuga Station, Somerset, New York."

Very truly yours,

Samuel R. Madison

Samuel R. Madison
Secretary

G-35

ERIE & NIAGARA COUNTIES REGIONAL PLANNING BOARD

Leo J. Nowak, Jr.
DIRECTOR

Walter J. Hoss, Jr.
CHAIRMAN
Joseph N. Williams
VICE CHAIRMAN
James V. Ryan
SECRETARY

June 21, 1978

Colonel Daniel Ludwig
United States Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The Erie and Niagara Counties Regional Planning Board has reviewed the draft Environmental Impact Statement relative to the Somerset Power Plant. Please note the following comments:

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81 1) The ENCRPB has applied for coastal energy impact planning funds from the New York State, Department of State. The funds would be used for developing a Somerset Coastal Energy Impact Program (see Attachment A). The success of the program will greatly depend on the cooperation of the New York State Electric and Gas Company (NYSE&G) and their participation on the Somerset Power Plant Committee. The latter will be formed as part of the Board's program. We would like to take this opportunity to draw your attention to the proposed Somerset planning effort as well as the need for NYSE&G in the Regional Planning Board's program. It is felt that the Proposed Somerset Coastal Energy Impact Program will be highly beneficial to local communities immediately impacted by the plant. In this regard, many of the environmental impacts addressed in the Somerset EIS could be alleviated through the Board's program.

82 2) ENCRPB Adopted Recreation and Open Space Plan and Program: The power plant land area conflicts with the Municipal Park 108 (i.e. proposed Potter Road Park) site. The latter is proposed for eventual development by 1980 by the Town of Somerset. It should be noted that the abovementioned ENCRPB Somerset Program will address the recreational potential of the site. This would alleviate the conflict between the plant and proposed park. However, the conflict should be referred to in the EIS.

NORTHTOWN PLAZA, 3168 SHERIDAN DR., AMHERST, NEW YORK 14226 • PHONE ERIE COUNTY (716) 837-8086 NIAGARA COUNTY (716) 285-9114

HELP SAVE OUR ENVIRONMENT — USE RECYCLED PAPER

Corps Response to Erie and Niagara Counties Regional Planning Board Comments

81 The applicant has advised the Corps that if a Somerset Power Plant Committee is formed, they would be willing to participate and cooperate with this committee.

The area designated for the park is along the Lake Ontario shore within the Somerset Plant Site, on the portion devoted to solid waste disposal. Present plans are to locate the solid waste disposal area 1,000 feet from the shore with a buffer zone created between the shore and the disposal area.

The applicant would be willing to work with the town of Somerset in the development of a park in this area of the site at the conclusion of its use as a disposal area. This is expected
82 approximately 10 years after the start of the plant operation, i.e. 1993.

Contours of the solid waste disposal area can be altered to suit the development of the park. The stabilized sludge which will be disposed of in this area will be able to accommodate light loads.

The applicant does not believe this area is suited for water-related recreational activities and will not allow these activities on its property.

Paragraph 3.005 has been expanded to include information on the ENCRPB plan and committee.

83 The statement concerning development of the residential/commercial corridor on both sides of the site boundaries has been deleted. The indication that the corridor would follow the realigned parkway has been added to the EIS. These changes may be found in Paragraphs 3.004 and 3.005.

3) ENCRPB Adopted Land Use Concept: The Land Use Concept indicates the proposed Lake Ontario Parkway as passing directly through the power plant site. The Concept also shows the land adjacent to the Parkway as a residential and commercial growth potential area. In regard to the Parkway, the EIS states that a route has not been established and thus the final route could easily be located around the site. This is satisfactory to the ENCPRB. Concerning the residential and commercial growth corridor, the EIS indicates that this is not a major conflict because the growth corridor would merely develop on both sides of the site boundaries. The ENCRPB feels that this is not a proper assumption. Rather than occurring adjacent to the power plant boundaries, the growth corridor would simply follow the re-aligned Lake Ontario Parkway. However, the overall impact of the power plant on the Adopted Land Use Concept will be examined during the abovementioned Somerset Coastal Energy Impact Program. It is recommended that the assumption concerning the commercial and residential growth corridor be deleted from the EIS. 83

It was determined that all other information contained in the EIS is consistent with ENCRPB plans and programs.

We would appreciate a written response to this correspondence at your earliest convenience. Thank you for your time in addressing this matter.

Very truly yours,

Leo J. Nowak, Jr.
Director

LJN:TJD:ms

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DONALD J. SMITH, P.E.
Commissioner

NIAGARA COUNTY

DEPARTMENT OF PUBLIC WORKS
69 PARK AVENUE
LOCKPORT, NEW YORK 14094

June 12, 1978

Colonel Daniel D. Ludwig
Department of the Army
Buffalo District Corps. of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

In the draft copy of the Environmental Impact Statement concerning construction of the proposed Power Station at Somerset, no consideration has been given to the impact of heavy construction equipment and material delivery on Town and County roads and bridges, and we would like to voice our concern in this matter.

Several roads in the vicinity of the proposed Power Station were not designed to accommodate heavy loads and high traffic volumes and could be seriously degraded by transportation of large amounts of construction equipment and material.

In the course of your general review of the Environmental Impact Statement, we request that you join with us in pointing out that there has been no acknowledgment of the impact of this project on the existing Town and County highway systems.

84 We would expect that a section entitled "Impact to Existing County and Town Highways, Bridges and Structures" be added to the Environmental Impact Statement and that such study be subject to the input, review and acceptance of the County Superintendent of Highways.

Very truly yours,

COUNTY OF NIAGARA
DEPARTMENT OF PUBLIC WORKS

Donald J. Smith, P. E.
Commissioner

DJS:HAP

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Corps Response to Niagara County Department of Public Works Comments

84 A new section entitled "Highways and Bridges" has been added to the EIS in Chapter Four, the Probable Impact of the Proposed Action on the Environment. This new section appears as Paragraph 4.053a. Corps staff met with the Department of Public Works staff and the Commissioner to discuss the seriousness of the problem and to identify critical areas. There are numerous roads which will be unable, in their present state, to handle heavy equipment transport and several bridges which could not safely handle the expected heavy duty loads. The applicant was advised of the problems that may be encountered and has indicated a willingness to meet with the Department of Public Works to plan travel routes that would avoid these critical areas.

NEIL F. STAFFORD
Director

(716) 434-2871

NIAGARA COUNTY
DIVISION OF ECON. DEV. & PLANNING
NIAGARA COUNTY OFFICE BUILDING
59 PARK AVENUE
LOCKPORT, NEW YORK 14094

June 6, 1978

Colonel Daniel D. Ludwig, P.E.
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

ATTENTION: Regulatory Functions Branch

Dear Colonel Ludwig:

Submitted herewith is a list of comments relative to the Draft Environmental Impact Statement for the proposed New York State Electric and Gas Corp. Somerset generating station. We appreciate the opportunity to comment while the statement is still in draft form.

As you can see from the attached Resolution #207-77, the Legistature of Niagara County is on record as favoring construction of this facility. Our department has been asked to participate in the proceedings.

Should you or your staff have any further questions, please do not hesitate to contact us.

Very tuly yours,

Theodore J. Belling

Theodore Belling, Planner

Enclosure

cj

Corps Response to Niagara County Division of Economic Development and Planning (NCDEDP) Comments

The source of coal will not and cannot be the sole determining factor for the route of the trains to the proposed Somerset Station. The coal sources are not known at this time and furthermore will probably change over the life of the station. The only positive statement than can be at this time made is that the coal will come through Niagara Falls and/or Rochester.

85 The applicant is presently engaged in a study to determine which of four alternate routes is preferable. The environmental factors under consideration are: topography, scenic-visual resources, land use, hydrology, soils, vegetation, wildlife, historic and archeological resources, traffic, air, noise and socioeconomics. The impact of route construction, operation and maintenance on the above factors will be evaluated in selecting the route. The Summary has been modified to reflect this statement.

86 Paragraph 1.035 has been amended to include this information.

87 Figure 1-14 has been modified to include Agricultural District No. 5.

88 The population figures presented in these paragraphs are not exclusive for any minor civil division and, thus, do include the village of Barker.

89 Paragraph 2.022 has been modified to include this information.

90 Lockport has been added to Paragraph 2.029 since it does include industrial areas significant enough to be mentioned.

91 The original Figure 2-1 has been deleted and replaced with a more up-to-date zoning map for the town of Somerset.

92 At this time, specific figures are not available regarding the attendance update for Krull Park. However, staff has been advised by the Niagara County Division of Economic Development and Planning that the latest figures are projected to be similar to those in the draft EIS. Paragraph 2.062 has been modified to include fishing as a recreational use of Krull Park.

93 The species mentioned in this comment have been added to the discussion in Paragraph 2.065. The lamprey control and fishing ban information has been updated.

ENVIRONMENTAL IMPACT STATEMENT
Department of the Army Permit Application No. 76-484-29

85	Summary page i.	Paragraph 2. (End of paragraph) Coal source alone should not determine route of coal trains . . . route should be determined also by environmental factors as well as other area industries who could benefit from the same rail line route
86	Page 1-25 Pg.	1.035 - - The rail corridor does not connect with a branch line of Conrail. This line is owned by trustees of Penn Central. From Barker east it has been abandoned by NYS DOT and is up for sale. If it is sold, there will be no rail service from the east. Service from the west would require replacing .6 miles of track and extensive rehabilitation. Environmental opposition of getting coal to the site via new route seems to be increasing
87	Page 1-81	We would call your attention to Agricultural Dist # 5 through which the proposed power transmission route passes. (Map herewith)
88	Page 2-5	Paragraph 2.012 & 2.013 - - These population figures evidently do not include the village of Barker which is within the Township and close enough to be impacted.
89	Page 2-9	Paragraph 2.022 -- Branch line is not owned by Conrail and is not presently an operating railroad.
90	Page 2-12	Paragraph 2.029 -- Second paragraph should include industrial areas of Lockport.
91	Pg. 2-22	Paragraph 2.058 -- Enclosed herewith is up-to-date zoning map for Town of Somerset.
92	Pg. 2-27	Paragraph 2.062 -- A survey is currently under way to up date attendence figures for Krull Park. New figures will be supplied as soon as available.
93	Pg. 2-28	Paragraph 2.065 -- Fishing information is outdated. Brown trout, Rainbow trout, Coho and chinook salmon should be included. Lamprey problem is solved, and fishing ban has been replaced by a warning.
94	Pg.2-45 & 2-46	Paragraph 2.104 -- The visual sensitive Erie Barge Canal could be greatly impacted if a new rail line were built over it. According to testimony by a NYSE&G Attorney, May 23 1978 at the Lockport Municipal Building, this is presently being considered as a rail route.

Corps Response to NCDEDP Comments (Cont'd)

94 Paragraph 2.104 has been amended to include this information.

85 The information developed for Table 2-12 was based on pollutant sources located within what was defined as the Somerset AQAI "Air Quality Area of Impact." This air quality area of impact was based on calculated facility impacts for a power plant using low sulfur coal and no flue gas desulfurization (FGD) system. Since issuance of the draft EIS, the applicant has redesigned the plant to include an FGD system. The original Table 2-12 is now obsolete and has been deleted. A more pertinent regional emission inventory by source type and pollutant is presented in Appendix Table B-5. The major reason for deleting the AQAI type inventory (as contained in the draft EIS) is that background air quality for the purpose of calculating impacts of the proposed facility is based on actual measured levels of ambient air quality and not on the calculated impacts from any of these regional point sources. Thus, the table has no bearing on the ultimate calculation of facility impacts.

95 The gill nets used for the baseline study were 125 feet long, and six feet deep and contained five 25-foot panels of graded mesh (1, 2, 2.5, 3, and 3.5 square inch or bar mesh). During 1977 studies, 1/2-inch mesh was added. The collection effort was designed to demonstrate both spatial and temporal distribution patterns. Gill nets were generally set for 24-hour periods. A 15-foot wide otter trawl with a 0.75-inch square mesh body and a 0.25-inch square bar mesh cod end liner was used to survey small bottom fish near shore. The actual trawling speed is not known by Corps staff. Seining efforts utilized 20- and 40-foot seines (0.25-inch bar mesh) during the 1974-75 study.

A lack of understanding of day/night differences in ichthyoplankton densities at Somerset exists since this type of sampling was not performed during the 1974-75 studies. A detailed description of the entire sampling program is beyond the scope of an Environmental Impact Statement which is a summary-type document. However, details of the program are presented in the applicant's Article VIII application which is on file at the Buffalo District Office.

97 and 98 The draft EIS does not refer to the genus Myoxocephalus, the deepwater sculpin. This genus was not identified in the Somerset site collection.

The sculpins taken were either Cottus bairdi or Cottus cognatus, the mottled and slimy sculpin, respectively.

95 Page 2-64 & 2-65 Table 2-12 -- While this office lacks specific information re. air pollution, it seems that locations somewhat down wind and far removed such as National Gypsum are included while closer locations such as Simonds Saw and steel in Lockport are not included. Other possibilities might be Harrison Radiator, Lockport; Frontier Stone, Lockport; Allied Chemical, Wilson; as well as industries on the eastern edge of Niagara Falls.

96 Page 2-112 Paragraph 2.247 -- The fish collection data does not include methodology ie. what mesh size, gill nets were used and at what speed trawl nets were towed. What time of day was sampling done (fish larve density may increase 10 to 100 times at night vs. day light).

97 Page 2-117 Table 2-24 -- There are no previous reports of tessellated darter in Lake Ontario. It would probably be johhny darter. Also which sculipen was collected myorocephalus is very rare

98 Pg. 2-119 Paragraph 2.257 -- Tessellated darter is mentioned again.

99 Pg. 2-119 Paragraph 2.259 -- Fish gut analysis should include fish size, number and seasonal distribution.

100 Page 2-120 Paragraph 2.261 -- Since many fish egg sizes are similar, it would seem inaccurate to assume that they were alewife without labatory identification.

101 Page 3-3 Paragraph 3.011 -- Plans for Niagara County to expand Royalton Ravine Park have been abandoned. At this time, there are no expansion plans for this park.

102 Page 4-14 Paragraph 4.034 -- Yellow perch spawning usually occurs prior to June 15, some times as early as May 15th. If this species spawns at the site, blasting schedule should be altered.

103 Page 4-27 Paragraph 4.095 -- The applicant has amended their plans so that the Dysinger Substation will no longer be needed

104 Page 4-42 Paragraph 4.131 -- Since the sockeye salmon does not inhabit Lake Ontario, its crusing speed seems superfluous. Fowever, current stocking program includes Lake trout, Brown trout as well as salmonoids. Therefore, swimming speeds for these species should be included.

105 Page 4-49 Table 4-9 -- The Russell Station is in closer proximity to Somerset than Ginna, therefore, it would be important to compare their impingement date also. Studies indicate impingement rates increase at night; any decrease in intake volume at night could effect totals.

Corps Response to NCDEDP Comments (Cont'd)

97 98 The johnny darter (Etheostoma nigrum) is a species exhibiting a wide range of forms and morphological characteristics. Scott and Crossman (1973) reports that Stone (1947) and Cole (1965), studying the olmstedi subspecies of E. nigrum both

> "considered olmstedi to warrant specific status. Cole (1967), in a comprehensive study of the new species, considered it to be composed of four subspecies. Few specimens were examined by Cole from Canadian waters. One sample, from the confluence of the Ottawa and St. Lawrence Rivers, although identified as E. olmstedi (instead of E. n. olmstedi as formerly) was considered to consist of intergrades of two subspecies of E. olmstedi, E. o. stromaculatum x E. o. olmstedi. Indeed, all populations of the New York watershed of Lake Ontario and the St. Lawrence River, were considered to be intergrades of these two subspecies."

Scott and Crossman (1973) identify tessellated darter as a subspecies of Etheostoma nigrum and call it tessellated johnny darter, as distinguished from central johnny darter or scaly johnny darter. They conclude that the species is polymorphic and that precise taxonomic differentiations must await further research.

The 44 specimens collected were all identified as tessellated darter by NUS Corporation, the applicant's consultant. To a larger degree due to the similarity and interbreeding of these closely related species (or subspecies), the question of whether the specimens are Johnny or tessellated darter is academic. Neither is on the threatened or endangered list and the facility represents no special hazard to these bottom-dwelling fish.

Subsequent to the Somerset collection, another consultant for the applicant has identified E. olmstedi from collections made in Mexico Bay at the eastern end of Lake Ontario. This tends to support the previous identification made independently at Somerset.

99 The table presented in Paragraph 2.259 summarizes more extensive information contained in the Article VIII application Pages 74.2-758 through 74.2-788 and Tables 74.2-1085 - 74.2-1145. The Article VIII application is on file at the Buffalo District Office. Due to the large volume of information and analyses generated in regard to the proposed facility, it is not possible to include it all.

The summary data is based on examination of 25 white sucker stomachs, 73 white perch, 11 rock bass, 31 yellow perch, 20 rainbow

98 smelt and three salmon. In general, the food items represent food taken during the late spring through fall period from fish in the adult size category.

99 This comment is essentially correct in that one cannot base positive identification on egg size. However, this assumption has not been made and no alewife eggs are reported in Table 2-25.

The paragraph cited in this comment states that no alewife eggs were identified in the 1974 collections. The suggestion is made that "Most of the unidentified eggs may have been alewife . . ." and some reasons why this might be the case were provided.

100 Paragraphh 3.011 has modified to reflect this change in expansion plans.

102 The blasting schedule was arrived at after consultation with New York State DEC and a full consideration of the spawning activities of all species known to occur at the site. The habitat in the vicinity of the site is not preferred spawning habitat for yellow perch, and only two yolk sac larvae and six early larvae of this species were taken in the 1974 collections (see Table 2-25). Yellow perch typically spawn in areas with rooted vegetation, submerged brush or fallen trees (Scott and Crossman, 1975), a habitat type not available in the site vicinity. While some limited spawning apparently occurs over the sand, gravel or bedrock substrate characteristic of the site vicinity, accommodating the blasting schedule to avoid the yellow perch spawning period (which could begin as early as mid-April) was not deemed necessary to assure the protection and propagation of this species.

103 References to the Dysinger Substation have been deleted since the applicant now intends to tie directly into the existing PASNY system. This is reflected in Paragraph 1.116 of the final EIS.

104 The reference to sockeye salmon has been deleted and swimming speeds of other Lake Ontario fish have been added to Paragraph 4.131.

105 Russell Steam Station impingement data were available in written testimony by C. Hornibrook - NYSPSC from the State hearings and will be used here to compare to the Somerset estimated impingement

Corps Response to NCDEDP Comments (Cont'd)

rates. In this testimony, the Russell Station is estimated to impinge the following:

Species	Metric tons/yr
Alewife	.37
Rainbow Smelt	.16

In Paragraph 4.142 of the EIS, the Somerset estimated impingement expressed in metric tons is given as:

Species	Metric tons/yr
Alewife	8.83
Rainbow Smelt	.97

185 If the Russell Station figures are scaled up to account for their lower cooling water flow volume the Russell figures would be multiplied by 2.1 (528 cfs at Somerset/251 cfs of Russell = 2.1). Using the Russell impingement rate would then yield an estimate for Somerset impingement as follows:

Species	Somerset Estimated Impingement in Metric Tons
Alewife	.37 x 2.1 = .777
Rainbow Smelt	.16 x 2.1 = .336

These estimates are very much lower than the present estimate of impingement for the proposed plant. Use of these numbers would indicate that the plant will have much less impact than currently predicted. The existing estimates are, therefore, conservative. Also, NYSDEC studies at Cape Vincent, NY, have shown that fish species distributions are not consistent throughout Lake Ontario and thus extrapolation and scaling efforts are not wholly reliable.

Reduction in cooling water flow rate at night is not envisioned for the proposed plant since this would impair the plant's efficiency and the plant will be a base load unit, not a peaking unit.

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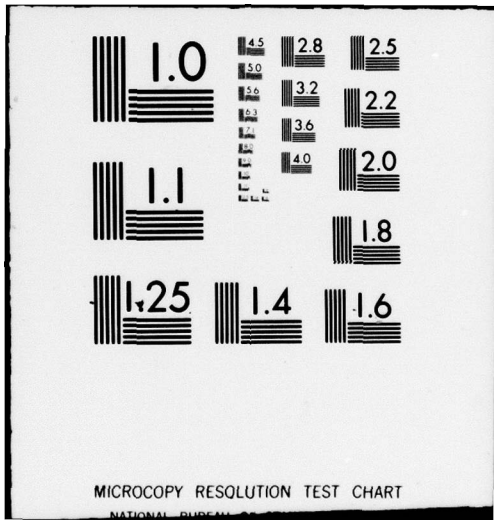
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GLOSSARY

abiotic - Nonliving; pertaining to physio-chemical factors only.

absorption - The process of taking in and making part of the existent whole.

acclimation - Adjustment to environmental change on the part of the individual; the physiological adjustment or increased tolerance shown by an organism to environmental change.

acclimation temperature - The temperature at which a test organism has been held and has adjusted to physiologically.

acidity - Having pH less than 7.

acute - A high level response (usually death) observed within a short period of time (96 hours) (opposite of chronic).

adaptable - Capable of undergoing inheritable (and/or nonheritable) structural or functional changes.

adsorption - The adherence of substances to the surfaces with which they are in contact (but not in chemical combination).

aerobic - Living, active, or occurring only in the presence of oxygen or air.

aerosol - A suspension of fine solid or liquid particles in a gas.

algae - Any of a group of chiefly marine or freshwater chlorophyll-bearing aquatic plants with no true leaves, stems or roots. Ranging from microscopic single-cell organisms or colonies to large microscopic seaweeds, etc.

alkalinity - The quality of being alkaline or basic in pH, i.e. greater than pH 7 (opposite of acid).

ambient - The background condition.

Amphipoda - An order of small crustaceans usually having a laterally compressed body; commonly known as sand fleas, sand hoppers, and scuds.

anaerobic - Capable of living in the absence of air or free oxygen.

aquifer - A water bearing stratum of permeable rock, sand, or gravel.

baseline study - Used for a complete survey of the environmental conditions and organisms existing in a region prior to unnatural disturbances.

base load generation - It is the practice in a system with several generating plants to generate as much energy as possible from generating units with the lowest production costs, and to keep such units loaded in continuous service except for necessary maintenance. A unit so loaded is categorized as base load generation.

bedrock - The solid rock at the surface or other underlying surface materials.

benthos - The organisms living in or on the sediments of freshwater and marine habitats.

biocide - Any chemical or agent that kills organisms.

biochemical oxygen demand - The amount of oxygen required to decompose (oxidize) a given amount of organic compounds to simple, stable substances.

biomass - The matter constituted by living organisms.

biota - All of the named or namable organisms of an area; fauna and flora of a region.

bloom - A sudden increase in the abundance and/or production of one group or species of producer organism.

blowdown - The ejected stream of steam, water, or sediment from boilers or cooling towers.

border line purchase - A purchase by a customer loaded in the service area of an electric system and billed by such system, but the customer is supplied with electric service from a neighboring utility system by appropriate arrangements between the two systems.

British thermal unit - The quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

buffer zones - Designated areas adjacent to highways, streams, public property, scenic areas, historic site, or other areas of special public concern.

canopy - The leafy cover of vegetation, e.g. the uppermost leafy layer in forests.

capability - The maximum load which a generating unit, station, or other electrical apparatus, can carry.

capacity - The load for which a generating unit or station is rated.

capacity factor - The quotient of the average load on a machine divided by the capacity rating of the machine.

chlorophyll - The photosynthetic pigment of plants; chlorophyll *a* is a specific kind of chlorophyll found in most algae.

chlorophyta - (green algae) Planktonic algae commonly having two, four, or eight flagella and green pigmentation.

chronic - A low level response that causes no immediately apparent effect; however, when exposure is continued over a long period of time, the organism is eventually harmed.

chrysophyta - (golden brown algae) A group of algae found in the plankton and characterized by a golden brown pigmentation. Includes the diatoms which form silicon shells resembling two halves of a box.

circuit - A circuit is a conductor or a system of conductors through which an electric current flows or is intended to flow.

circuit mile - A measure of distance applied to a single three-phase circuit regardless of the number of conductors per phase or of the number of other similar circuits on the same transmission tower or right-of-way.

Cladocera - An order of small crustaceans normally called water fleas.

cold shock - The sudden loss of a warm water environment (plant shutdown) resulting in an organism being returned to a colder ambient which may exceed its lower lethal threshold.

coliform - Structurally and functionally resembling certain bacteria of the vertebrate intestine called *Bacillus* or *Escherichia coli*.

combined cycle unit - A unit that has a gas turbine in combination with a waste heat boiler in order to allow the high temperature exhaust from the gas turbine to produce steam and ultimately electric energy.

community - A group of organisms constituting some living portion of an ecosystem; a group of interacting populations.

community structure -	The relative abundance and diversity of the species which compose the community.
conductor size -	Measured in circular mils. When a conductor size is prefixed by a number such as 2 or 4, the number denotes that there is more than one conductor per phase.
conifer -	Any of a type of evergreen trees and shrubs with botanically true cone, e.g., pines, ceders, and hemlocks.
cooling tower -	A heat exchanging device which transfers reject heat from circulating water to the atmosphere.
cooling tower, dry-	Where the cooling water is contained in a closed system and its heat dissipated to the air through heat exchangers.
cooling tower, wet -	Where water is recirculated through the condenser after it has been cooled in an evaporative cooling tower or other cooling system in which the heated water is exposed to circulating water.
Copepoda -	A subclass of usually minute (0.1 to 5 mm) crustaceans, mostly pelagic or free-swimming.
corona -	A luminous discharge due to ionization of the air surrounding a conductor, caused by a voltage gradient exceeding a certain critical value.
cost, capital-	Cost of construction of new utility plant and expenditures for the purchase of acquisition of existing utility plant facilities.
cost, production-	The annual cost of maintenance and fuel and operating labor.
critical aquatic organism -	A species found to be of comparative importance due to its role in the lake ecosystem.
critical thermal maxima -	A temperature which causes distress, disorientation, and perhaps death to a test organism upon instantaneous exposure; also called heat shock temperature.
Crustacea -	A large class of (arthropodan) animals, usually aquatic, bearing a horny shell; includes lobsters, barnacles, shrimp, water fleas, etc.
Cryptophyta -	A group of small single-celled algae; many members of this group have one to two flagella (whip-like organelles) which provide locomotory capability.

Cyanophyta -	(blue-green algae) Planktonic algae blue-green in color. Members of this group are considered to be nuisance species because they form thick blooms in phosphate-rich waters.
decibel -	Measure of sound level as a logarithmic function of input and output levels.
decomposers -	Collectively, those organisms in a community which convert dead organic materials into inorganic materials.
demersal -	Sinking to the bottom of a stream or other body of water.
deer soft-wood shelter -	An area of coniferous species (pine, hemlock, spruce, or fir) where deer concentrate in winter.
diatoms -	A group of algae characterized as single-celled plants which are enclosed within silica cell walls.
diffuser -	A device used to speed up the mixing process, thereby rapidly reducing average temperature or concentration.
direct cooling -	A cooling water system which draws water from a natural source, passes it through the main condensers, and returns it to a natural body of water.
discharge plume -	The water mass originating from the plant discharge; characterized by an elevated temperature over the lake waters; the temperature diminishes with distance from the discharge point due to mixing.
dissolved oxygen -	An amount of gaseous oxygen dissolved in a volume of water.
distillate oil -	Light No. 2 oil used to fuel gas turbines.
diversity factor -	The ratio of the sum of the noncoincident maximum demands of two or more loads to their maximum demand for the same period.
economic mix -	A group of generating units which in combination produce the lowest total capital and production costs for a given system.

ecosystem - Collectively, all organisms in a community functioning with the associated environmental factors and the biotic and abiotic interactions between these units.

ecotone - A transition zone between two recognized communities.

electrogas-dynamics - The phenomena arising from the motion of electrically conducting gas in the presence of electric and magnetic fields.

electrostatic precipitator - A device for removing small particles of smoke, dust, oil, mist, etc. from air by passing the air through an electrically charged screen which gives a charge to the particles; the charged particles are then passed between two charged plates where the particles are attracted to one of the charged plates.

endangered species - Species that are in danger of becoming extinct.

energetics - The study of the manner of energy flow and its transformations within a system.

energy requirements - The electric energy requirements of a system, including losses, defined as: (1) net generation of a system, plus (2) energy received from others, less (3) energy delivered to other systems for resale.

epilimnion - The uppermost layer of a thermally stratified lake.

ET_{50} - Median effective temperature at which 50% of the test organisms become immotile.

facultative heterotrophy - The ability of a photosynthetic plant to exist without sunlight by utilizing secondary energy sources.

fauna - Animals; as in the taxonomic sense, the species, or kinds, of animals in a region.

fish kill - Pertaining to the sudden death of a fish population.

fish larvae - Small, recently hatched fish which are capable of limited movement and may be transported largely by water currents.

fixed charges - As used in cost studies, this term refers to annual costs attached to the ownership of property such as depreciation, taxes, insurance, cost of money, and in some instances, rents, general and administrative expenses, and necessary

regular maintenance.

flagellates - Organisms that possess motility by means of whip-like structures (flagella).

flora - Plants; specifically, the plants growing in a geographic area.

fly ash - Fine particles of ash of a solid fuel, carried out of the flue of a furnace with the waste gases produced during combustion.

food web - Collectively, the trophic relationships among organisms of the community.

forage - To travel in search or pursuit of food.

forage fishes - Those fishes who provide a major food source for the larger carnivorous species.

forced outage - The occurrence of a component failure or other condition which requires that a generating unit or other major equipment be removed from service immediately.

forest cover type - A classification of forested areas into categories according to the predominant trees and associated vegetation, sufficiently uniform in composition and development to distinguish it from other forest types.

fossil fuel - Fuels extracted from the earth (e.g., coal, oil, or gas).

generating capacity - Gross power generated minus power used for plant auxiliaries.

gross generation - The total amount of electric power produced by a generating unit or a generating plant as measured at the generator terminals.

groundwater - Water found underground in porous rock or soil strata.

habitat - The natural area where a plant or animal lives.

habitat formers - Those organisms whose presence defines the type and group of biota which will be found in association with it.

heat rate, net - A measure of generating station thermal efficiency, generally expressed in Btu per net kilowatthour. It is computed by dividing the total Btu content of fuel burned for electric generation by the resulting net kilowatthour generation.

herbaceous - Any plant lacking woody tissue and in which the leaves and stem fall to ground level during freezing or drying weather.

herbicide - A chemical substance used to kill plants or inhibit plant growth.

herbivore - An animal which eats plants as a major portion of its diet.

hydrostatic head - Pressure resulting from a column of fluid.

hypolimnion - The lower water layer of a thermally stratified lake.

ichthyoplankton - Fish eggs and larvae which are more or less free floating.

impingement - The process by which fish are pressed against and trapped on travelling screens designed to remove debris from the cooling water intake streams of power plants; impinged fish may be either returned to the water body or removed and disposed of; impingement mortality refers to those fish which die as a result of this contact with the power plants.

intermediate range unit - A generating unit that is normally operated to provide power for loads between base load and peak load levels.

invertebrate - An animal which does not have a vertebral column.

invert elevation - The elevation measured to the bottom of a structure rather then the top.

isopleth - A line on a map connecting points at which a variable has a specified constant value.

isotherm - A line on a map or lake chart connecting points that have the same temperature.

kilovolt - 1000 volts.

kilowatthour - The basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit steadily for one hour.

leaching - The removal of various soluble materials from surface soil layers by the passage of water through (around) the layers.

lead time -	Period of time between the initiation of a facility and commercial operating date of that facility.
lethal threshold -	The exposure temperature at which a group of test organisms, when acclimated to a given temperature, will suffer 50% mortality. Also called incipient lethal temperatures.
limnetic -	The open water zone to the depth limit of light penetration of a lake.
littoral -	The shallow portion of the lake from the shoreline to the limit of benthic plant growth (usually of rooted aquatics).
load center -	A point at which the load of a given area is assumed to be concentrated.
load factor -	The quotient of the average load during a designated period divided by the peak or maximum load occurring in the same period.
loss of load probability -	The long run average number of days in a period (usually one year) that the hourly integrated daily peak load exceeds the available generating capacity.
lower lethal threshold -	A low temperature exposure which results in 50% mortality when the organism is acclimated to a higher temperature.
LT_{50} -	Temperature lethal to 50% of sample (requires time of exposure) (also TL_{50}) (and TLm).
macroflora -	The larger plants visible with the unaided eye; includes both vascular plants and algae.
macroinvertebrates -	The larger, more visible species of invertebrates; in Lake Ontario, these include aquatic worms and insect larvae.
magnetohydrodynamics -	The phenomena arising from the motion of electrically conducting fluids in the presence of electric and magnetic fields.
mero -	A prefix denoting partiality; for example, a merobenthic organism spends only a portion of its life as a part of the benthic community.
megawatt -	1000 kilowatts.
metabolic rate -	The rate at which physiological processes (e.g., digestion and respiration) take place in an organism.
micro -	Prefix designating 0.000001 units. For example, microgram (ug) equals 1/1,000,000 grams.

mollusc -	Any of a phylum of invertebrate animals including oysters, clams, mussels, snails, slugs, squids, octopi, whelks, and other shellfish.
morphology -	The study of the form and structure (but not the functions) of an organism.
mortality -	Death in a population; the death rate.
natural draft cooling tower -	A cooling tower through which air is circulated by natural draft or chimney effect.
nauplii -	An early swimming life stage of the Crustacea.
neckton -	Free-swimming organisms capable of maintaining their position in the water column in the presence of normal water currents.
nutrients -	Chemical elements essential to life.
nutrient cycling -	The process by which chemical materials essential for life pass from an inorganic state to be assimilated by the producer organisms, distributed to the biomass of the lake and eventually returned to the inorganic state by decomposers.
oligochaeta -	One of the classes of segmented worms; when dense populations of these small worms occur they are commonly called sludge worms.
once-through cooling -	Where cooling water is taken from a suitable source, passed through the condenser, and returned to the source body of water. Same as "direct cooling."
organic -	Compounds containing carbon (and Hydrogen); living or derived from living matter.
organism -	Any living or recently dead thing.
output -	The amount of electric energy delivered by a generating unit, station, or system.
oxygen depletion -	Removal or exhaustion of oxygen by chemical or biological use.
particulate -	Any material greater than 0.000001 meter (one micron or a micrometer) in diameter.
peaking generation -	Generation which is normally designed for use during the maximum load period of a designated time interval.

peak load - The greatest of all demands of the load under consideration which occurred during the prescribed period of time.

periphyton - Community of organisms usually small but densely set, closely attached to stems and leaves of rooted aquatic plants or other surfaces projecting above the bottom.

pesticide - Toxic chemical used for killing organisms. Usually widely toxic to living things.

pH - Negative logarithm of hydrogen-ion concentration; a numerical expression of acidity (see acidity, alkalinity).

photosynthesis - Synthesis of carbohydrates from carbon dioxide and water with chlorophyll as a mediator, using light as energy with oxygen as a by-product.

phytoplankton - Small, mostly microscopic, plants floating in the water column.

piscivores - animals which eat fish.

plankton - Small organisms (either animals or plants) passively floating in water; macroplankton are relatively large (1.0 mm to 1.0 cm), mesoplankton of intermediate size, and microplankton are small.

plankton (mero) - Organisms with temporary planktonic phases in their life cycle, e.g., oyster and crab larvae.

plant succession - The replacement of one kind of plant assemblage by another through time.

plume - The spatial volume in which the characteristics of a discharge effluent can be detected or sensed.

plume entrainment - The process by which organisms are drawn into the discharge plume of a power plant along with the water volume similarly involved.

population - A group of organisms of the same species.

population density - The number of individuals of a population per unit area or volume.

power - The rate of performing work.

power transfer capability - The maximum power which a transmission interface can carry under specified conditions for a given time interval without exceeding approved limits of temperature, capacity of associated equipment, system stability, and other factors.

pumped storage - An energy storage system in which water is temporarily pumped to a higher elevation and stored for later use to drive a hydroelectric turbine and remove the energy at the time of greater need.

raptors - Any of several birds of prey (hawks, falcons, eagles, owls).

reserve capacity - The difference between net system capability and system capability and system maximum load requirements. It is the margin of capability available to provide for scheduled maintenance, emergency outages, system operating requirements, and unforeseen loads.

reserve margin - The quotient of the excess capability of a system divided by the peak demand load.

right-of-way - Corridor of land available through easement or fee ownership utilized by an electric utility system for its distribution or transmission facilities.

riprap - The sustaining wall of stone spread without order on an embankment slope to prevent erosion.

Rotifera - Phylum which includes microscopic multicellular organisms which are found in great variety and abundance in all types of freshwater habitats.

salinity - The concentration of any salt; concentration of sodium chloride is, technically, "halinity" or "sodium chlorinity."

sediment - Any usually finely divided organic and/or mineral matter deposited by air or water in nonturbulent areas.

seepage - The relatively slow trickling of water or other liquid from a source.

seiche effect - The cyclic displacement of water levels along the length of the lake due to a number of factors including the size, shape, and orientation of the lake and the prevailing winds.

selective clearing -	Removal or destruction of specifically designated species, types, or sizes of plant material within specified areas.
shrub -	A woody perennial of smaller height than a tree.
siltation -	Referring to the deposition of silt-sized (smaller than sand-sized) particles.
species -	The smallest natural population regarded as sufficiently different from all other populations to deserve a name, and assumed or proved to remain different despite interbreeding with related species.
species composition -	The kinds and numbers of species occupying an area.
species diversity -	A measure of the richness in number of species in a community.
stratified period -	The time during which there is no mixing between the separate water layers within the lake on the basis of temperature differences.
supersaturated	The condition of a medium carrying more of a substance than would be expected under normal conditions.
suspended solids -	Refers to solid (particulate) materials held in suspension; i.e., in more or less turbulent air or water, and capable of settling out when turbulence ceases.
synergism -	Two substances acting together to produce an effect greater than the sum of their individual effects.
taxon -	General term for any division of the biological classification system.
terrestrial -	Of land, the continents, and/or dry ground; contrasted to aquatic.
thermocline -	That area of the lake where the temperature of the water changes 1°C/1 meter of depth.
threshold -	The level of concentration for a substance or condition below which no response can be detected in the test organism.
time of day metering -	Time off day metering identifies the various types of loads imposed on the system by time of day so that the differing costs of these loads may be effectively billed.

tolerance - An organism's capacity to endure or adapt to (usually temporary) unfavorable environmental factors.

toxic - Poisonous.

trace elements - Chemical elements appearing in minute quantities in natural systems or media; may occasionally be concentrated by specific organisms. Nutrients, though in minute quantities, are not usually called trace elements.

transect - A line (or belt) through a community on which are indicated the important characteristics of the individuals of the species observed; sampling along a transect may be plotless or refer to specific plots.

transmission interface - One or more transmission circuits which are identified to measure power flows into or out of an area.

trapping - An atmospheric phenomenon in which a stack-emitted plume exhibits downward but not upward expansion in the downwind direction due to an inversion layer aloft.

traveling screen - A mechanized or movable set of frames covered with an open mesh screen which is interposed in a stream flow path to intercept debris.

trophic level - The position of an organism or group within the food web; characterized by the kind of food consumed and how it is obtained.

turbidity - Condition of water resulting from suspended matter; water is turbid when its load of suspended material is conspicuous.

ultimate incipient lethal temperature - (also called ultimate lethal threshold) The highest temperature to which an organism may be acclimated and the temperature above which a warm acclimated organism will die.

upland - All types of land forms other than depressions (occupied by lakes, swamps) or those areas in close proximity to rivers, streams or seas (floodplains, beaches).

upwelling - The large scale movement of deep water toward the surface of a water body.

vegetation - Plants in general, or the total assemblage of plants, and their gross appearance as determined by the largest and most common. Flora is used for the list of kinds of plants.

velocity cap - An intake structure design in which the water flow into the structure is along lines horizontal to the bottom.

vertebrate - Those animals possessing a spinal column or backbone, i.e., fishes, birds, amphibians, mammals, and reptiles.

volatiles - Materials that pass into a gaseous state at ordinary temperatures and pressures; in geochemistry, substances that readily move or have moved through the earth's atmosphere.

voltage - The voltage of a circuit in an electric system is the electric pressure of that circuit measured in volts. In a three-phase, it is generally expressed in terms of the voltage between phase conductors.

warmwater fisheries - The organized, sustained exploitation of populations of fishes inhabitating warm (or tropical) water; usually implies bass, pike, etc., in contrast to salmonid fisheries.

water table - The upper limit of that part of the ground which is saturated with water.

watershed - An entire drainage basin including all living and nonliving components of the system.

watt - The electrical unit of power or rate of doing work equivalent to one ampere flowing under a pressure of one volt at unity power factor.

wetlands - Land containing high quantities of soil moisture, i.e. where the water table is at or near the surface for most of the year.

woodland - Areas dominated by small scattered trees with little overlap of canopy branches, or loosely, a small tract of closed forest.

young of year (YOY) - Refers to fishes during their first year of life.

zooplankton - The animal component of the plankton; typically composed of small crustaceans (e.g., copepods) and rotifers.

ABBREVIATIONS

AEC	Atomic Energy Commission
ASCE	American Society of Chemical Engineers
BOD_5	biochemical oxygen demand
Btu	British thermal unit
$CACO_3$	calcium carbonate
cal	calorie
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHG&E	Central Hudson Gas & Electric Corporation
cm	centimeter
CO	carbon monoxide
Cu	copper
dB	decibel
dBA	A-weighted decibel
DEC	(New York State) Department of Environmental Conservation
--°	degree (plane angle)
°C	degree - Centigrade
°F	degree - Fahrenheit
DO	dissolved oxygen
DOT	New York State Department of Transportation
dw	dry weight
EPA	(U.S.) Environmental Protection Agency
Fe	iron
FEA	Federal Energy Administration
FGD	flue gas desulfurization
FPC	Federal Power Commission
fps	feet per second
ft	foot
g	gravitational acceleration factor, 32 feet per second^2
GNP	Gross National Product
gpd	gallons per day
gpm	gallons per minute
gps	gallons per second
HC	hydrocarbon
hr	hour
H_2SO_4	sulfuric acid
Hz	Hertz (cycles per second)
km	kilometer
kV	kilovolt
kw	kilowatt
kwh	kilowatthour
lbs	pounds
LILCO	Long Island Gas & Electric Company
LUNR	Land Use and Natural Resource

M	mega-, (10^6)
m	meter
MCM	millions of circular mills
MeV	megaelectronvolt (10^6)
mg	milligram
mg/l	milligrams per liter
m-	mille-, (10^{-3})
mph	miles per hour
--'	minute (plane angle)
MSL	mean sea level
MVA	megavolt-ampere
MW (MWe)	megawatt
NAAQS	National Ambient Air Quality Standards
N	nitrogen
Ni	nickel
NMPC	Niagara Mohawk Power Corporation
NO	nitrogen oxide
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NSPS	New Source Pollution Standards
NRC	Nuclear Regulatory Commission
NYCRR	New York Code of Rules and Regulations
NYPP	New York Power Pool
NYS	New York State
NYSE&G	New York State Electric & Gas Corporation
P	phosphorus
PASNY	Power Authority of the State of New York
ppb	parts per billion
ppm	parts per million
%	percent
PENELEC	Pennsylvania Electric Company
PSAQD	Prevention of Significant Air Quality Deterioration
RA	radium
RG&E	Rochester Gas & Electric Corporation
--"	second (plane angle)
SiO_2	silica
SO_2	sulfur dioxide
SS	suspended solids
TDS	total dissolved solids
Th	thorium
TSP	total suspended particulates
TVA	Tennessee Valley Authority
u (μ)	micron, micro- , (10^{-6})
ug (μg)	microgram
USGS	U.S. Geologic Survey
V	volt
W	watt
yr	year
zn	zinc

ENGLISH TO METRIC CONVERSION TABLE

ENGLISH	MULTIPLY BY	METRIC
Acre	0.4047	Hectares
Acre	0.4047	Sq. Meters
Btu	252	gram-calories
Cubic feet	0.0283	cubic meters
Cubic feet	28.32	liters
Cubic inches	16.39	Cubic centimeters
Cubic inches	0.0164	liters
Cubic yards	0.7646	cu. meters
Cubic yards	7646	liters
Feet	30.48	centimeters
Feet	0.3048	meters
Feet/sec	30.48	cms/sec
Feet/sec	18.29	meters/min
Gallons	3785	cubic cms
Gallons	0.003785	cu. meters
Gallons	3.785	liters
Inches	2.540	centimeters
Inches	0.0254	meters
Miles	1.609	kilometers
Miles	1609	meters
Ounces	28.35	grams
Pounds	453.59	grams

ENGLISH	MULTIPLY BY	METRIC
Pounds	0.4536	kilograms
Sq. Feet	0.0929	sq. meters
Sq. Inches	6.452	sq. centimeters
Sq. Miles	2.590	sq. kilometers
Sq. Miles	2.590×10^6	sq. meters
Temperature (^oF) -32	5/9	Temp. ^oC
Tons (short)	0.9078	metric tons
Tons (short)	907.18	kilograms
Yards	91.44	centimeters
Yards	0.914	meters

METRIC TO ENGLISH

METRIC	MULTIPLY BY	ENGLISH
Centimeters	0.394	inches
Cu. Centimeters	0.0610	cu. inches
Cu. Meters	0.0008107	acre-feet
Cu. Meters	35.315	cu. feet
Gram	0.00268	pound
Hectares	2.471	acres
Kilograms	2.2046	pounds
Liters	0.0353	cu. feet
Liters	0.2642	gallons
Liters	33.814	ounces

METRIC	MULTIPLY BY	ENGLISH
Meters	1.0936	yards
Meter	3.281	feet
Metric Ton	1.1023	tons (short)
Sq. Kilometer	0.3861	sq. mile
Sq. Meter	10.764	sq. feet
Sq. Meter	1.196	sq. yards
Temperature (^{o}C) +32	9/5	Temp. ^{o}F

Change in Temperature: A one degree change in temperature on the Centigrade scale is equivalent to 1.8 degree in the Fahrenheit scale. e.g. a temperature rise of 2°C is equivalent to a temperature rise of 3.6^{o}F. A one degree Fahrenheit change in temperature is equivalent to a 0.555 degree change on the Centigrade scale. e.g. a temperature rise of 3°F is equivalent to a temperature rise of 1.66^{o}C.